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For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **2632**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **2633**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **2633**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **N.A.**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **N.A.**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **2634**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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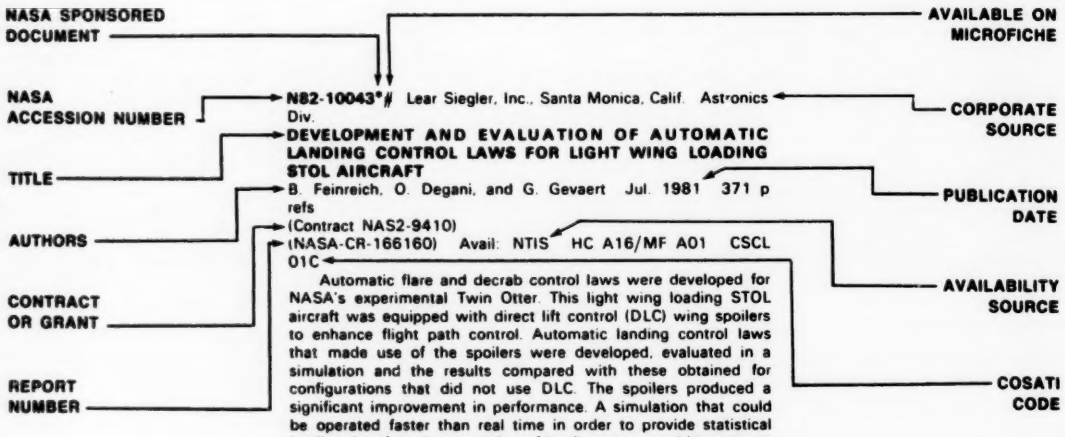
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated ar ' its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 18 SEPTEMBER 23, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-27214*# Rockwell International Corp., Los Angeles, Calif. North American Aircraft Operations.
FEASIBILITY OF SPF/DB TITANIUM SANDWICH FOR LFC WINGS Final Report
Fred T. McQuilkin Hampton, Va. NASA. Langley Research Center Jun. 1982 62 p refs
(Contract NAS1-16236)
(NASA-CR-165929) Avail: NTIS HC A04/MF A01 CSCL 01B

The feasibility of fabricating SPF/DB titanium structures of sufficient smoothness to be used for laminar flow wing surfaces was demonstrated. Two methods of fabricating panels which meet the surface smoothness criteria were demonstrated. The first consists of superplasticity forming/diffusion bonding a panel using steel dies, then machining the surface to the required flatness and finish after forming. This approach, however, was estimated to be more costly than the second approach, in which the panel is formed against ceramic platens which produce the desired surface smoothness without subsequent finishing. Four panels were fabricated, and their surface quality was evaluated. The specified criteria for waviness compared with actual measured values on the panels is shown. The acceptable surface quality as well as feasibility of the laminar flow control surface design, in which separate strips incorporating the boundary layer bleed provisions are bonded into slots on the surface, was also demonstrated. S.L.

N82-27215*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FINITE DIFFERENCE METHODS FOR THE SOLUTION OF UNSTEADY POTENTIAL FLOWS
F. X. Caradonna Jun. 1982 36 p refs Prepared in cooperation with Army Aviation Research and Development Command
(NASA-TM-84248; NAS 1.15:84248; AVRADCOM-TR-82-A-7) Avail: NTIS HC A03/MF A01 CSCL 01B

Various problems which are confronted in the development of an unsteady finite difference potential code are reviewed mainly in the context of what is done for a typical small disturbance and full potential method. The issues discussed include choice of equations, linearization and conservation, differencing schemes, and algorithm development. A number of applications, including unsteady three dimensional rotor calculations, are demonstrated. M.G.

N82-27216# Air Force Academy, Colo. Dept. of Aeronautics.
AIR FORCE ACADEMY AERONAUTICS DIGEST: SPRING/SUMMER 1981 Final Report
A. M. Higgins, ed., F. M. Jonas, ed., E. J. Jumper, ed., J. M. Kempf, ed., and B. Gregory, ed. Dec. 1981 110 p refs
(AD-A112421; USAFA-TR-81-11) Avail: NTIS HC A06/MF A01 CSCL 20/4

This Digest covers unclassified research in aeronautics performed at the United States Air Force Academy during the six months ending 15 July 1981. This report includes technical papers in the specific areas of aerodynamics, propulsion, experimental instrumentation, engineering education and aeronautical history. Topics include: The Mass Flux Surface Boundary Condition for Linarized Potential Flow; A Numerical Investigation of the Effects of Fin Planform Parameters on the Subsonic Cruise Performance of a Supersonic Arrow Wing Configuration; An Improved Method for Calculation of Static Thrust for the USAFA J-85/13 Turbojet Engine; Pressure Measurement Using a High-Speed Data Acquisition and On-Line Calibration System; Cadet Performance during Summer Academics-Repeat versus non-repeat students; Reflections of an English Literature Major on Our Technological Society; and The Evolution and Future of Aeropropulsion Systems. GRA

N82-27217# Logistics Management Inst., Washington, D. C.
DEPOT SUPPORT OF GAS TURBINE ENGINES Final Report
T. J. OMalley and David V. Glass Oct. 1981 39 p
(Contract MDA903-81-C-0166)
(AD-A107141; LMI-ML103) Avail: NTIS HC A03/MF A01 CSCL 15/5

This report assesses the DoD's capacity and capability to support the depot maintenance requirements of gas turbine engines over the next 5-10 years. Special attention is given to newer nonaeronautical applications (tanks, marine propulsion, and cruise missile). Gas turbine engines used in fixed and rotary wing aircraft will continue to dominate the engine workload; the gas turbines used in cruise missiles, tanks, and ships will comprise less than 10 percent of the total engine workload by 1990. Additional depot maintenance capacity to support gas turbine engines is not required. The depots have adequate capacity today, and since the gas turbine workload is projected to increase by only 6 percent between FY 82 and FY 87, capacity should remain adequate through the 1980s. The Military Departments have the required capabilities to support the new nonaeronautical gas turbine engines entering the DoD inventory. They have repaired similar engines, both in size and technology, for several years. Author (GRA)

N82-27218# Office of Naval Research, London (England).
A TECHNICAL ASSESSMENT OF AERONAUTICAL ENGINEERING IN ISRAEL
Joseph A. Strada 1 Jul. 1981 8 p refs
(AD-A106980; ONRL-R-5-81) Avail: NTIS HC A02/MF A01 CSCL 01/3

A variety of Israeli academic and industrial institutions are discussed with an eye toward assessing research and development activities in aeronautical engineering disciplines. Each institution is described in brief and some of its current research projects are listed. Research in aerodynamics, guidance and control, propulsion and combustion is discussed and industrial product lines are described where appropriate. Some conclusions are drawn in an effort to assess the country's overall capabilities in aeronautical engineering. Author (GRA)

N82-27219# General Accounting Office, Washington, D. C. Mission Analysis and Systems Acquisition Div.

OPPORTUNITIES TO REDUCE THE COST OF SOME B-52 MODIFICATIONS Report to Secretary of Defense
9 Apr. 1982 7 p
(AD-A113563; GAO/MASAD-82-30) Avail: NTIS HC A02/MF A01 CSCL 05/1

As part of our ongoing review of the overall modernization of the strategic bomber force, we have paid particular attention to the Air Force's plans for modifying the B-52 force. We found that certain costly items may not be needed in view of the missions of the various models of the B-52 force and their expected life in the force. More specifically, the offensive avionics system (OAS) modification could be scaled back on 67 B-52Gs by deleting unneeded components for a potential savings of $21.6 million; using certain components acquired for B-52Ds on other B-52 aircraft could further reduce OAS funding needs by $33.3 million; and a $35 million modification to comply with SALT II may not be needed on B-52Hs that have been modified to carry cruise missiles. GRA

N82-27220# RAND Corp., Santa Monica, Calif.
PREPLANNED PRODUCT IMPROVEMENT AND OTHER MODIFICATION STRATEGIES: LESSONS FROM PAST AIRCRAFT MODIFICATION PROGRAMS Interim Report
Frederick Biery and Mark Lorell Dec. 1981 78 p refs
(Contract F49620-82-C-0018)
(AD-A113599; RAND/N-1794-AF) Avail: NTIS HC A05/MF A01 CSCL 15/5

Pre-Planned Product Improvement (P31) is a weapon system acquisition strategy formulated in the late 1970s in a response to the high development costs of new systems, lengthening acquisition intervals, increasing age of current inventories, constrained budgets, and various technology trends. It is founded on the assumption that quality enhancement modification of existing inventory systems is a cheaper and quicker way to modernize than the development of entirely new systems. The P31 strategy is aimed at facilitating this process; its central element is the design of new systems from their origins to accommodate future quality upgrades. Discussion of the merits and disadvantages of P3I, however, remains abstract and theoretical. This Note reviews the circumstances that led to the formulation of P3I, clarifies the implications of the concept and offers an initial assessment of the policy as applied to aircraft systems based on a careful and extensive examination of past major aircraft modification efforts. The authors conclude that long-range pre-planning during the design stage is impractical. This note also provides lessons drawn from past experience on the conduct of modification programs in general. Author (GRA)

N82-27221# Clemson Univ., S.C. Dept. of Mathematical Sciences.
SPECIFICATION AND ESTIMATION OF DYNAMIC COST FUNCTIONS FOR AIRFRAME PRODUCTION AIRFRAMES
Thomas R. Gulledge, Jr. Dec. 1981 185 p refs
(Contracts N00014-75-C-0451; F33615-81-K-5116; NR Proj. 365-049)
(AD-A113147; N135) Avail: NTIS HC A09/MF A01 CSCL 14/1

The cost behavior of the airframe industry is unique. Cost minimization models are specified that have potential for modeling this unique production situation. These models are firmly grounded in economic theory, and they stress the importance of learning and production rate as determinants of program costs. As an empirical application, one of the models is applied to the F102 airframe program. Author (GRA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N82-27222*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THREE-DIMENSIONAL FLOWS ABOUT SIMPLE COMPONENTS AT ANGLE OF ATTACK
David J. Peake and Murray Tobak Mar. 1982 59 p refs Presented at the AGARD Lecture Series No. 121 on High Angle of Attack Aerodyn., Hampton, Va., 10-11 Mar. 1982
(NASA-TM-84226; A-8859; NAS 1.15:84226; PAPER-2) Avail: NTIS HC A04/MF A01 CSCL 01A

The structures of three dimensional separated flow about some chosen aerodynamic components at angle of attack are synthesized, holding strictly to the notion that streamlines in the external flow (viscous plus inviscid) and skin friction lines on the body surface may be considered as trajectories having properties consistent with those of continuous vector fields. Singular points in the fields are of limited number and are classified as simple nodes and saddles. Analogous flow structures at high angles of attack about blunt and pointed bodies, straight and swept wings, etc., are discussed, highlighting the formation of spiral nodes (foci) in the pattern of the skin friction lines. How local and global three dimensional separation lines originate and form is addressed, and the characteristics of both symmetric and asymmetric leeward wakes are described. Author

N82-27223*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
DEVELOPMENT OF A NONLINEAR VORTEX METHOD Progress Report, 1 Oct. 1981 - 31 Mar. 1982
Osama A. Kandil Jun. 1982 69 p refs
(Grant NsG-1560)
(NASA-CR-169092; NAS 1.26:169092) Avail: NTIS HC A04/MF A01 CSCL 01A

Steady and unsteady Nonlinear Hybrid Vortex (NHV) method, for low aspect ratio wings at large angles of attack, is developed. The method uses vortex panels with first-order vorticity distribution (equivalent to second-order doublet distribution) to calculate the induced velocity in the near field using closed form expressions. In the far field, the distributed vorticity is reduced to concentrated vortex lines and the simpler Biot-Savart's law is employed. The method is applied to rectangular wings in steady and unsteady flows without any restriction on the order of magnitude of the disturbances in the flow field. The numerical results show that the method accurately predicts the distributed aerodynamic loads and that it is of acceptable computational efficiency. Author

N82-27224# Analytical Methods, Inc., Redmond, Wash.
A SEPARATION MODEL FOR TWO-DIMENSIONAL AIRFOILS IN TRANSONIC FLOW Final Technical Report, 15 Nov. 1978 - 30 Nov. 1981
Frank A. Dvorak and D. H. Choi Jan. 1982 41 p refs
(Contract DAAG29-78-C-0004)
(AD-A112146; ARO-15866.2-E) Avail: NTIS HC A03/MF A01 CSCL 20/4

A calculation method for transonic separated flow about two dimensional airfoils at incidence is presented in this report. The method is capable of predicting the effects of both leading- and trailing-edge separated flows, although the former is usually associated with a complete collapse of the airfoil flow field, in which case the flow is no longer supercritical. A viscous potential flow iteration procedure provides the connection between potential flow, boundary layer and wake modules. The separated wake is modelled in the potential flow analysis by thin sheets across which exists a jump in velocity potential. These sheets are analogous to vorticity sheets in incompressible flow. The basic potential flow method is a modification of Jameson's full potential method. Calculations for four different airfoils have been compared with experiment for pressure distributions as well as integrated forces. The agreement between theory and experiment is generally good even when shock waves are present. Author (GRA)

N82-27225# Naval Ship Research and Development Center, Bethesda, Md.
PROCEEDINGS OF THE 12TH NAVY SYMPOSIUM ON AEROBALLISTICS, VOLUME 1
May 1981 451 p refs Symp. held at Bethesda, Md., 12-14 May 1981 2 Vol.
(AD-A111763) Avail: NTIS HC A20/MF A01 CSCL 20/4

Partial Contents: Missile Aerodynamics; Aerodynamics of Tactical Weapons to Mach No. 8 and Angle of Attack 180 Deg.; An Inviscid Computational Method for Tactical Missile Configura-

tions; Triservice Data Base Extension of PROGRAM MISSILE; Theoretical and Experimental Supersonic Lateral-Directional Stability Characteristics; Aerodynamics of a Rolling Airframe Missile; Approximate Method for Predicting Supersonic Normal Force Coefficient of Very-low-aspect-ratio Lifting Surfaces; Supersonic Aerodynamics of a Class of Cone-Derived Waveriders; Determination of Aerodynamic Characteristics of Ballistic Projectiles at Transonic Speeds; Store Separation; Study of Flow Fields and Store Forces in Close Proximity to a Triple Ejection Rack at Transonic Speeds; Computer Program for Simulating the Six-Degree-of-Freedom Motion of Missile Debris Fragments; An Influence Function Method for Predicting Aerodynamic Characteristics during Weapon Separation; Submissile Aerodynamics during Dispensing; Gun Launch Dynamics of the Navy 5-Inch Guided Projectile; Dynamics of Subsonic Tracer Projectiles; Thrust Augmentation for Tomahawk Cruise Missile; and Drag Characteristics and Suitability of Three-Foot Long Parachute Decelerators. GRA

N82-27226# Air Force Geophysics Lab., Hanscom AFB, Mass. Aerospace Instrumentation Div.

SOME UNIQUE APPLICATIONS FOR TETHERED BALLOON SYSTEMS

Catherine L. Rice, Arthur O. Korn, George H. McPhetres, and F. V. Hunsinger 5 Nov. 1981 7 p refs Presented at the AIAA Aerodynamic Decelerator and Balloon Technol. Conf., San Diego, Calif., 20-23 Oct. 1981

(AF Proj. 7659)

(AD-A107292; AFGL-TR-81-0297; AIAA-81-1916) Avail: NTIS HC A02/MF A01 CSCL 01/3

Properly designed tethered balloon systems are remarkably versatile test platforms. They can be erected quickly, to great heights and provide unobstructed viewing. This paper describes several systems designed and operated by the Air Force Geophysics Laboratory: a dual array to erect and recover a 1000-ft square flexible net with carbon fiber collectors; a single tether supporting sensors along its length for boundary layer measurements; a tritethered emergency substitute for a LORAN antenna; and tritethers for weapons evaluation and for tests of the Surveyor Moon lander. GRA

N82-27227# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

A STUDY OF WALL JETS AND TANGENTIALLY BLOWN WINGS Final Report, 1 Jan. 1976 - 31 Mar. 1981

N. D. Malmuth, W. D. Murphy, and J. D. Cole Jul. 1981 177 p refs

(Contract N00014-76-C-0350)

(AD-A106986; SC5055.21FR) Avail: NTIS HC A09/MF A01 CSCL 20/4

A study of transonic wall jets and tangentially blown wings has been performed by using asymptotic and computational methods. For the portion of the effort dealing with wall jets, both submerged and coflowing cases have been investigated. For the submerged configurations, the nature of the decay process for disturbances emanating from the jet exit has been examined. In this analysis, the Kutta condition on the nozzle rim can be satisfied merely by requiring streamwise continuity of the potential across the rim as a trailing edge for the flow. With this model, the slip line boundaries create an exponential damped sinusoidal relaxation of the disturbances as compared to algebraic decay for analogous unconfined flows. A similar observation applies to wind tunnel far fields. The nonlinear case differs from the linear one in that the amplitude of the downstream propagated disturbance interacts nonlinearly with the near field in the former case. For these wall jets, acceleration to criticality is accomplished by stream tube contractions and throats induced by upstream influence of the turning. In the coflowing case, selection rules defining various jet flow regimes in terms of the jet transonic similarity parameter and pressure level are given. Conditions are prescribed which define the penetration length for supersonic disturbances downstream from the exit as well as the location of the throats in the jet. The criticality of the flow far downstream is also quantified in terms of these parameters. GRA

N82-27228# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

STEADY/OSCILLATORY, SUPERSONIC/HYPERSONIC INVISCID FLOW PAST OSCILLATING WINGS AND WEDGE COMBINATIONS AT ARBITRARY ANGLES OF ATTACK M.S. Thesis

Evangelos Vlassios Youroukos Jun. 1981 182 p refs

(AD-A107438) Avail: NTIS HC A09/MF A01 CSCL 20/4

The perturbation method proposed by Professor Hui is described. The method gives exact solutions for the perturbed flow over both sides of a flat plate which is oscillating with small amplitude and frequency at large angles of attack in steady supersonic/hypersonic inviscid flow provided that the shock remains attached. Using the strip theory concepts these solutions are extended to study the dynamic stability in pitch of a flat, periodically oscillating wing arbitrary planform shape, at large angles of attack. Finally, Hui's perturbation method is extended on a stationary wedge. Author (GRA)

N82-27229# Transportation Systems Center, Cambridge, Mass.

CHICAGO MONOSTATIC ACOUSTIC VORTEX SENSING SYSTEM. VOLUME 3: EXECUTIVE SUMMARY: DECAY OF B-707 AND DC-8 VORTICES Final Report, Oct. - Dec. 1981

D. C. Burnham and J. N. Hallock Jan. 1982 29 p refs

(AD-A113570; TSC-FAA-79-18-3; FAA-RD-79-103-3) Avail: NTIS HC A03/MF A01 CSCL 01/2

A Monostatic Acoustic Vortex Sensing System (MAVSS) was installed at Chicago's O'Hare International Airport to measure the strength and decay of aircraft wake vortices from landing aircraft. The MAVSS consists of an array of acoustic antennas which measure the vertical profile up to 60-m altitude of the vertical component of the wind. The decay in wake vortex strength is measured as the vortex passes over successive antennas in the array. In this volume, the results of Volume II are summarized in terms of the safety implications of categorizing all landing B-707s and DC-8s as large aircraft. GRA

N82-27230# Air Force Geophysics Lab., Hanscom AFB, Mass. Aerospace Instrumentation Div.

THE AIR-LAUNCHED BALLOON SYSTEM (ALBS) DEVELOPMENT PROGRAM, PHASE 2 Final Scientific Report

Andrew S. Carten, Jr. 15 Dec. 1981 100 p refs

(AF Proj. 7659)

(AD-A113958; AFGL-TR-81-0350; AFGL-IP-306) Avail: NTIS HC A05/MF A01 CSCL 01/3

The circumstances leading to the second phase of the Air-Launched Balloon System Development Program are described, along with the governing design constraints. Individual component development efforts and system design modifications are described in turn: the procurement and testing of the new dewar, the qualification of the updated cryogenic unit, the redesign of the balloon/parachute interface, the solution of the extraction line recoil problem, and the development of a reliable cryogenic unit recovery system. The complicated command, control, and telemetry subsystem is also described in detail. The results of component tests and a system dress rehearsal system test are summarized. Preparations for two full-scale system tests conducted in 1981 are covered in considerable detail. The results of those tests are presented and the test data are analyzed. It is concluded that the system's air-launch and mid-air inflation techniques are acceptable. The balloon requires structural reinforcements, however, before the system can be said to be fully developed. Author (GRA)

N82-27231# Kentucky Univ., Lexington. Dept. of Mechanical Engineering.

VORTEX BREAKDOWN AND INSTABILITY Final Report, 1 Mar. - 30 Sep. 1981

Shiva N. Singh Sep. 1982 27 p refs

(Grant AF-AFOSR-0146-81; AF Proj. 2307)

(AD-A113091; AFOSR-82-0214TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Solutions of the full steady axisymmetric Navier-Stokes equations for breakdown in an unconfined viscous vortex have been obtained by Grabowski and Berger. The core Reynolds numbers were varied up to 200 and a two-parameter family of velocity distributions was assumed upstream as the boundary condition. In this report, the Richardson numbers corresponding to the developing solution profiles of Grabowski and Berger are

calculated and shown graphically. The inviscid linear stability of the swirling velocity profiles as calculated by Grabowski and Berger is investigated with respect to non-axisymmetric disturbances. This eigenvalue problem is solved numerically for various wave numbers and it is shown that the developing velocity profiles lead to instability. These results are believed to be useful in analyzing instabilities for a trailing vortex from an aircraft.
Author (GRA)

N82-27232*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AGARD THREE-DIMENSIONAL AEROELASTIC CONFIGURATIONS
S. R. Bland Mar. 1982 17 p refs Prepared in cooperation with AGARD, Neuilly-Sur-Seine, France
(NASA-TM-84708; NAS 1.15:84708; AGARD-AR-167) Avail: NTIS HC A02/MF A01 CSCL 01A

The calculation of unsteady aerodynamic forces in the critical transonic speed regime is investigated. The development of such methods is be enhanced by the availability of a limited number of test cases for the comparison of competing methods. Test cases for five clean, isolated wings are presented. Wing geometric descriptions, airfoil coordinates, and suggested aerodynamic conditions for each are included. S.L.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N82-27233*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARACTERISTICS OF FUTURE AIRCRAFT IMPACTING AIRCRAFT AND AIRPORT COMPATIBILITY
D. William Conner May 1982 26 p refs
(NASA-TM-84476; NAS 1.15:84476) Avail: NTIS HC A03/MF A01 CSCL 01C

Results are reported of an opinion survey of selected individuals at the decision-making level within the five major manufacturers of transport aircraft in the United States and Europe. Opinions were obtained concerning both possible and probable existence of over 50 compatibility-related characteristics of transport aircraft in use in the years 1990, 2000, and 2010. The maximum size of aircraft is expected to increase, at a roughly uniform rate, to the year 2010 by 85 percent in passengers, 55 percent in airfreighter payload, and 35 percent in gross weight weight. Companion to the expected growth in payloads and gross weight was the identification of probable increases in aircraft geometrical dimensions and component capability, and use of fully double-decked passenger compartments. Wing span will increase considerably more than normally expected to provide wings of higher aspect ratio. New aircraft features coming into probable use include large turboprops, synthetic jet-A fuel, winglets, wake-vortex-reducing devices and laminar flow control. New operational concepts considered probable include steep approaches, high-speed turnoffs, and taxiway towing for the aircraft, plus passenger bypass of the terminal building, expedited handling of belly cargo and an intermodal cargo container for the payloads. B.W.

N82-27234*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ASSESSMENT OF ALTERNATE THERMAL PROTECTION SYSTEMS FOR THE SPACE SHUTTLE ORBITER
H. Neale Kelly and Granville L. Webb May 1982 13 p refs Presented at the AIAA/ASME Joint Thermophys. Heat Transfer Fluids and Plasma Conf., St. Louis, 7-11 Jun. 1982
(NASA-TM-84491; NAS 1.15:84491) Avail: NTIS HC A02/MF A01 CSCL 22B

Candidate concepts are identified. The impact on the Shuttle Orbiter performance life cycle cost, and risk was assessed and technology advances required to bring the selected TPS to operational readiness are defined. The best system is shown to be a hybrid blend of metallic and carbon-carbon TPS concepts. These alternate concepts offer significant improvements in reusability and are mass competitive with the current ceramic tile reusable surface insulation. Programmatic analysis indicates approximately five years are required to bring the concepts to operational readiness. T.M.

N82-27235*# National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC INVESTIGATIONS TO DETERMINE POSSIBLE ICE FLIGHT PATHS
W. Burgsmueller, H. Frenz, P. May, and G. Anders Mar. 1982 77 p Transl. into ENGLISH of Vereinigte Flugtechnische Werke--Fokker GMBH Rept-Ef-586, 18 Jan. 1977 84 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76648; NAS 1.15:76648) Avail: NTIS HC A05/MF A01 CSCL 01C

After flights with the VFW 614 under severe icing conditions, damage to the engine was found. In wind tunnel tests a determination of the origin of this ice was made; it is supposed that the damage was caused by this ice. On the modified flight test model of the VFW 614 on a 1:15 scale, measurements were conducted in the VFW-Fokker wind tunnel with exposed particles which represented the free ice. The results of this testing are presented. Author

N82-27236# Boeing Commercial Airplane Co., Seattle, Wash. Systems Technology Div.
AIRCRAFT ALERTING SYSTEMS STANDARDIZATION STUDY. VOLUME 1: CANDIDATE SYSTEM VALIDATION AND TIME-CRITICAL DISPLAY EVALUATION Final Report, Feb. - Nov. 1980
G. P. Boucek, D. A. Po-Chedley, B. L. Berson, D. C. Hanson, M. F. Leffler, and R. W. White Jan. 1981 116 p refs
(Contract DOT-FA79WA-4268)
(AD-A107225; FAA/RD-81/38/1) Avail: NTIS HC A06/MF A01 CSCL 01/2

This report is one of a series of documented studies directed to the improvement and standardization of aircraft alerting systems. The purpose of the study was to develop and validate, through simulation, functional design criteria that can be used in designing effective aircraft alerting systems. The major objectives of this phase study were to: resolve system component questions; validate the two candidate system concepts by comparison to a representative baseline system, for both the pilot and flight engineer stations; evaluate presentation media and display formats for time-critical warnings; develop guidelines for the design of alerting systems. The system component questions were resolved in a series of experiments and the results were integrated into two system concepts for validation. In the validation tests, line-qualified pilots exercised the three alerting systems in a full-mission, fixed-base simulator. In all areas of measurement pilot performance was as good or better with the two candidate system designs than with the conventional, baseline system. The results indicate that a flight engineer station should contain the visual display components offered by the candidate system concepts. Voice was the recommended medium of presentation when rapid response is required. The time-critical display tests showed that fastest pilot response performance was obtained when graphic guidance alerts were placed in the pilot's primary field of view. The functional design criteria that were developed are contained in 'Aircraft Alerting System Design Guidelines, ' Report Number DOT/FAA/RD-81/38/11.
Author (GRA)

N82-27237# Federal Aviation Administration, Atlantic City, N.J.
PROCEEDINGS OF THE 1ST ANNUAL WORKSHOP ON AVIATION RELATED ELECTRICITY HAZARDS ASSOCIATED WITH ATMOSPHERIC PHENOMENA AND AIRCRAFT GENERATED INPUTS
Joseph J. Traybar and Nickolus O. Rasch Oct. 1981 38 p Workshop held at Atlantic City, 26-27 Feb. 1980
(FAA Proj. 182-340-100)
(AD-A107326; FAA-CT-81-205) Avail: NTIS HC A03/MF A01 CSCL 01/3

This workshop was to bring together the various elements

of the agency to engage in discussions to identify aviation related electricity hazards associated with both atmospheric phenomena and aircraft generated inputs, and determine a prioritize specific FAA problem area and/or requirements that need to be addressed. This information is vital in the development of the agency's posture and requirements in this important technology area.
Author (GRA)

N82-27238# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
CURRENT ADM RESTRAINT SYSTEM STATUS, TRADE-OFF CONSTRAINTS AND LONG RANGE OBJECTIVES FOR THE MAXIMUM PERFORMANCE EJECTION SYSTEM (MPES)
Marcus Schwartz Feb. 1982 31 p
(AD-A112645; NADC-82021-60) Avail: NTIS
HC A03/MF A01 CSCL 01/2

This report documents the restraint sub-system design options which were investigated for possible incorporation on the Navy Maximum Performance Ejection System (MPES). This study focused mainly on three ongoing development items for the advanced development model (ADM), but also considered some longer range objectives which address future requirements and anticipated technology developments which are necessary for a more comprehensive restraint package. Author (GRA)

N82-27239# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
AN OXYGEN ENRICHED AIR SYSTEM FOR THE AV-8A HARRIER Final Report
Richard L. Routzahn Oct. 1981 185 p refs
(AD-A112334; NADC-81198-60) Avail: NTIS
HC A09/MF A01 CSCL 06/11

Due to the high support costs, increase in aircraft down time and hazards associated with the utilization of liquid oxygen, development has been progressing with On-Board Oxygen Generation Systems (OBOGS) which have the capability of providing an aviator's breathing gas of sufficient quality and quantity. An Oxygen Enriched Air System (OEAS), employing the molecular sieve concept, has been subjected to environmental test and evaluation by the Naval Air Development Center. The OEAS contains a molecular sieve oxygen concentrator, breathing regulator and performance monitor. The test and evaluation program was conducted to verify that design criteria have been met and to establish system performance in the environments anticipated on the AV-8A Harrier and other tactical aircraft. The system has successfully demonstrated the ability, under certain conditions, to provide a breathing gas composed of 95 percent oxygen and 5 percent argon. It will also provide adequate amounts of breathing gas and sufficient oxygen concentrations for a one or two man open loop breathing schedule. Concentrator anomalies have occurred during the program with control electronics and lubricants within the unit. Redesign of the breathing regulator is necessary to insure compatibility with lox systems and in providing a greater gas quantity during ground idle conditions. Redesign of the performance monitor is necessary to withstand environmental conditions anticipated in service use. Prior to future aircraft incorporation, design studies must pay consideration not only to bleed air pressure availabilities, but also to temperatures which may degrade system performance.
Author (GRA)

N82-27240# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF AUTOMATIC INFLATION DEVICES FOR LIFE PRESERVERS Final Report
Jules Z. Lewyckyj 31 Jul. 1981 217 p refs
(AD-A107107; NADC-81226-60) Avail: NTIS
HC A10/MF A01 CSCL 06/7

This historical description covers the various commands and countries involved in development of automatic inflation devices (with a manual override) that would inflate a life preserver automatically on water contact when the wearer enters the water and is incapable of manually inflating his preserver. These developments began when a number of military personnel involved in deck and ejection seat aircraft operations at sea became convinced that a disabled person, wearing a life preserver, might have a much better chance of survival if the life preserver inflated automatically after the wearer was in the water. GRA

N82-27241# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
PROPOSED RESEARCH TASKS FOR THE REDUCTION OF HUMAN ERROR IN NAVAL AVIATION MISHAPS Final Report, 1 Jul. 1980 - Sep. 1981
Donald M. Layton Oct. 1981 24 p
(AD-A112339; NPS67-81-018) Avail: NTIS
HC A02/MF A01 CSCL 01/2

Seven possible areas of research are proposed that could lead to the reduction and/or mitigation of the human error involvement in Navy aircraft mishaps. These include tasks for the Naval Aerospace Medical Research Laboratory, other Navy and contracted activities. The following research actions have been recommended: Review of existing mishap reports; Cockpit review/analysis of existing Aircraft; Review and revision of standard anthrometrical data; Critical Incident Technique; Design/T&E cooperation procedures; Basic research into error causes; and Broad research functions. GRA

N82-27242# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF A BACKPACK SURVIVAL KIT FOR EJECTION SEATS
Thomas J. Zenobi and Gary F. Whitman 8 Feb. 1982 15 p (W0584001)
(AD-A113653; NADC-82024-60) Avail: NTIS
HC A02/MF A01 CSCL 06/7

The Navy is designing a Backpack Survival Kit (BSK) for ejection seats. Expected advantages of the BSK as compared to seat lid kits are less weight and more crewmember mobility during emergency egress from aircraft cockpits. With development of more sophisticated ejection propulsion systems, volume for survival kit stowage under the seat lid may not be available; the BSK offers an alternative stowage location. Design considerations include integration into the ejection seat system, attachment to the crewmember's restraint harness, stowage of survival gear, liferaft deployment, and crewmember mobility. Author (GRA)

N82-27243# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
SPECIAL INVESTIGATION REPORT: AIRCRAFT SEPARATION INCIDENTS AT HARTSFIELD ATLANTA INTERNATIONAL AIRPORT, ATLANTA, GEORGIA, OCTOBER 7, 1980
24 Sep. 1981 80 p
(PB82-123985; NTSB-SIR-81-6) Avail: NTIS
HC A05/MF A01 CSCL 01B

Under clear skies with 15 mile visibility, a chain of events occurred in which several aircraft, operating under the direction of air traffic control in the vicinity of the Hartsfield International Airport, Atlanta, Georgia, were inadvertently placed in positions which infringed upon normal separation standards. Five aircraft were involved, some in repetitive conflict situations. In at least two encounters, the pilots of air carrier aircraft found if necessary to take evasive action to avoid a collision. The National Transportation Safety Board's investigation concludes that similar circumstances could arise at any approach facility where the procedures and radar control equipment are similar to those at the Atlanta facility. These circumstances are described as well as an investigative technique involving the reduction and analysis of data extracted from an air traffic control radar system computer, which should prove useful in future investigations involving air traffic control issues. GRA

N82-27244# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
CABIN SAFETY IN LARGE TRANSPORT AIRCRAFT
9 Sep. 1981 57 p refs
(PB82-129297; NTSB-AAS-81-2) Avail: NTIS
HC A04/MF A01 CSCL 01B

A study by the National Transportation Safety Board showed that in 58.4 percent of the 77 survivable/partially survivable passenger carrying transport aircraft accidents/incidents occurring since 1970, there were failures of cabin furnishings. These failures killed, injured, entrapped or otherwise incapacitated aircraft occupants preventing successful emergency escape in many cases. Failures of cabin furnishings also created obstacles to egress by blocking aisles and exits. Regulations dealing with occupant

protection in crashes were last updated 30 years ago. They do not adequately reflect actual crash experience nor do they provide adequate protection to occupants in survivable crashes, especially the more severe crashes, where it is most needed. Recent accident experience supports the need to upgrade the current minimum design standards. Moreover, the technology exists for upgrading existing design and testing methods for cabin furnishings to meet the upgraded regulations. GRA

N82-27245# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS, INVOLVING CORPORATE/EXECUTIVE AIRCRAFT, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 67 p
(PB82-138967; NTSB-AMM-81-8) Avail: NTIS
HC A04/MF A01 CSCL 01B

Reports of U.S. general aviation corporate/executive aircraft accidents are given. Included are 77 accident briefs, 14 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injuries and causal/factors(s). GRA

N82-27246# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING MISSING AND MISSING LATER RECOVERED AIRCRAFT, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 72 p
(PB82-138959; NTSB-AMM-81-7) Avail: NTIS
HC A04/MF A01 CSCL 01B

Reports of U.S. general aviation missing and missing later recovered accidents are presented. Included are 68 accident briefs, 21 of which cover missing aircraft not recovered and 47 missing later recovered. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot certificate, injuries and causal factor(s). GRA

N82-27247# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING ALCOHOL AS A CAUSE/FACTOR, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 40 p
(PB82-138942; NTSB-AMM-81-6) Avail: NTIS
HC A03/MF A01 CSCL 01B

Reports on all U.S. general aviation accidents involving alcohol inpairment as a cause/factor are given. Included are 34 accident briefs, 30 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances and probable cause(s)/factor(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot certificate, injuries and causal factor(s). GRA

N82-27248# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF FATAL ACCIDENTS INVOLVING WEATHER AS A CAUSE/FACTOR, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 271 p
(PB82-138934; NTSB-AMM-81-5) Avail: NTIS
HC A12/MF A01 CSCL 01B

Report of all fatal U.S. general aviation accidents involving weather as a cause/factor for the year 1979 are presented. Included are 276 fatal accidents in the brief format. This format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated on all accidents involving weather as a cause/factor by type of accident, phase of operation, injury index, aircraft damage, pilots certificate, injuries and cause/factor(s). GRA

N82-27249# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING ROTORCRAFT, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 166 p
(PB82-138926; NTSB-AMM-81-4) Avail: NTIS
HC A08/MF A01 CSCL 01B

General aviation rotorcraft accidents are reported. Included are 289 accident briefs, 39 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, kind of flying, pilot certificates, injuries, and causes and related factors. GRA

N82-27250# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING TURBINE POWERED AIRCRAFT, US GENERAL AVIATION, 1979
16 Oct. 1981 110 p refs
(PB82-138918; NTSB-AMM-81-3) Avail: NTIS
HC A06/MF A01 CSCL 01B

General aviation turbine powered aircraft accidents are reported. Included are 171 accident briefs, 36 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances, and probable cause(s) fo each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot certificate, injuries and cause/factor(s). GRA

N82-27251# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING MIDAIR COLLISIONS: U.S. GENERAL AVIATION, 1979
16 Oct. 1981 54 p
(PB82-138900; NTSB-AMM-81-2) Avail: NTIS
HC A04/MF A01 CSCL 01B

General aviation accidents involving midair collisions are reported. Included are 25 accident files, 14 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by kind of flying, phase of operation, injury index, altitude of occurrence, airport proximity, aircraft damage, pilot certificate, injuries and causal factors(s). GRA

N82-27252# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
LISTING OF AIRCRAFT ACCIDENTS/INCIDENTS BY MAKE AND MODEL, U.S. CIVIL AVIATION, 1979
16 Oct. 1981 188 p
(PB82-138892; NTSB-AMM-81-1) Avail: NTIS
HC A09/MF A01 CSCL 01B

Civil aviation accidents/incidents, sorted by aircraft make and model are reported. Included are the file number, aircraft registration number, date and location of the accident, aircraft make and model and injury index for all 4,182 accidents/incidents occurring in this period. GRA

N82-27253# National Transportation Safety Board, Washington, D. C.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA: U.S. AIR CARRIER OPERATIONS, 1979
16 Nov. 1981 87 p
(PB82-134339; NTSB-ARC-81-1) Avail: NTIS
HC A05/MF A01 CSCL 01B

This record of aviation accidents in all operations of the U.S. air carriers for calendar year 1979 includes an analysis by class of carrier and type of service in which the 1979 performances are compared with 5 year base-period averages. A 10 year review, 1970 through 1979, of the certificated route carriers shows accident rates by aircraft make and model, types of accidents, phases of operation, causes or related factors, and a comparison of total which summarize the accidents, fatalities, and accident rates, causal tables; and briefs of accidents are included. GRA

N82-27254# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF FATAL ACCIDENTS INVOLVING FIXED-WING MULTI-ENGINE AIRCRAFT, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 148 p
(PB82-139007; NTSB-AMM-81-12) Avail: NTIS
HC A07/MF A01 CSCL 01B

The publication contains reports of fixed-wing multiengine general aviation aircraft accidents that occurred in 1979. Included are 15 turbojet, 51 turboprop and 444 reciprocating engine aircraft accidents. However, briefs of only the fatal accidents in the three categories are presented. The brief format presents the facts, conditions, circumstances and probable cause(s) for each accident. Additional statistical informatin is tabulated by injuries and cause(s) and related factor(s). GRA

N82-27255# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING COMPUTER AIR CARRIERS AND ON-DEMAND AIR TAXI OPERATIONS, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 168 p
(PB82-138991; NTSB-AMM-81-11) Avail: NTIS HC A08/MF A01 CSCL 01B

Reports of commuter air carrier and on-demand air taxi accidents are presented. Included are 50 commuter air carrier and 173 on-demand air taxi accident briefs. The brief format presents the facts, conditions, circumstances and probable cause(s) for each accident. Additional statistical information is tabulated by type of operation, injuries, aircraft weight, and cause(s) and related factor(s). GRA

N82-27256# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING AERIAL APPLICATION OPERATIONS, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 260 p
(PB82-138983; NTSB-AMM-81-10) Avail: NTIS HC A12/MF A01 CSCL 01B

Reports of U.S. general aviation aerial application accidents occurring in 1979 are given. Included are 395 accident briefs, 27 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additonal statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot certificate, injuries, kind of operation and causes/factors. GRA

N82-27257# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING AMATEUR/HOME BUILT AIRCRAFT, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 76 p
(PB82-138975; NTSB-AMM-81-9) Avail: NTIS HC A05/MF A01 CSCL 01B

Reports of U.S. general aviation accidents involving amateur/home built aircraft are presented. Included are 130 accident briefs, 36 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances and probable cause(s)/factor(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot certificate, injuries and causal/factor(s). GRA

N82-27258# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
BRIEFS OF ACCIDENTS INVOLVING GLIDERS, U.S. GENERAL AVIATION, 1979
16 Oct. 1981 44 p refs
(PB82-139015; NTSB-AMM-81-13) Avail: NTIS HC A03/MF A01 CSCL 01B

Reports of all U.S. general aviation accidents, occurring in 1979, involving gliders are presented. Included are 54 accident Briefs, 2 of which involve fatal accidents. The brief format presents the facts, conditions, circumstances and probable cause(s)/factor(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, injury index, aircraft damage, pilot age, injuries and causal factor(s). GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-27259*# Ohio Univ., Athens. Avionics Engineering Center.
A LORAN-C PROTOTYPE NAVIGATION RECEIVER FOR GENERAL AVIATION
Robert W. Lilley and Daryl L. McCall Aug. 1981 25 p refs Presented at the 4th Digital Avionics Systems Conf., St. Louis, Nov. 1981
(NASA-CR-169118; NAS 1.26:169118; TM-80) Avail: NTIS HC A02/MF A01 CSCL 17G

Prototype equipment was developed for flight evaluation which provides enroute navigation in both latitude-longitude and rho-theta coordinates. The nonprecision approach capabilities of this equipment was evaluated. The antenna/preamplifier coupler, the RF processor, tracking loop hardware, tracking loop software, and the video output are discussed. Laboratory and flight test results are evaluated. A.R.H.

N82-27260# Auburn Univ., Ala. Dept. of Electrical Engineering.
MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM (MATCALS) INVESTIGATION
E. R. Graf, Charles L. Phillips, and Scott A. Starks Apr. 1981 184 p refs Sponsored in part by Georgia Inst. of Technology, Atlanta
(Contract N00039-80-C-0032)
(AD-A107384) Avail: NTIS HC A09/MF A01 CSCL 17/7

The report is organized into three main sections, namely Part Two, Part Three, and Part Four. Part Two contains the results of an investigation into replacing the alpha-beta filter in the MATCALS digital controller with an observer, in order to reduce the effects of radar noise. Part Three presents a centroid algorithm based up return amplitude-versus-angle signature. Part Four presents an investigation of adaptive filtering algorithms for the MATCALS system. GRA

N82-27261# Ohio Univ., Athens. Dept. of Electrical Engineering.
EFFECTS OF HIGH VOLTAGE TRANSMISSION LINES ON NON-DIRECTIONAL BEACON PERFORMANCE Final Report, Jun. 1980 - Oct. 1981
Ismail Ibrahim and Raymond Luebbers Washington FAA Oct. 1981 184 p refs
(Contract DTFA01-80-C-10072)
(AD-A112311; QUEE-FAA-1-2; FAA-RD-81-82) Avail: NTIS HC A09/MF A01 CSCL 17/7

The potential for high-voltage transmission lines to interfere with the operation of non-directional beacons through the mechanisms of coronagenerated radio noise or passive reradiation of the desired signal has been assessed by use of computer prediction models. The generated noise levels were calculated for both AC and DC lines using methods found in the appropriate literature which have previously been compared with measured data. The reradiated signal levels were computed using a moment-method wire model computer program. This approach was validated by measurements made and reported herein. For all situations considered, it was concluded that locating an NDB near a high-voltage transmission line should not impair the function of the NDB due to either corona noise or passive reradiation from the line. GRA

N82-27262# Center for Naval Analyses, Alexandria, Va. Operations Evaluation Group.
A RESULT IN THE THEORY OF SPIRAL SEARCH
Walter R. Nunn Mar. 1980 16 p refs
(Contract N00014-76-C-0001)
(AD-A112481; CNA-PP-274) Avail: NTIS HC A02/MF A01 CSCL 17/7

This note presents a result in the theory of spiral search which does not seem to be available in the literature in spite of its straightforward derivation and obvious applicability in certain types of 'real life' search problems. The result gives the probability of detection as a function of time for a class of prior distributions of search-object, i.e. target, position centered at the origin of the x,y plane. We restrict attention to a spiral-type search in which the searcher covers the AOU(area of uncertainty) in concentric rings, moving out from the center. In the common case that the prior density is circular normal, the time to detection is seen to be approximately exponentially distributed. This is a somewhat counter-intuitive result in that the detection rate is constant, since it would appear that detection rate must decrease with time as the searcher moves from high probability areas to low probability areas. GRA

N82-27263# Federal Aviation Administration, Atlantic City, N.J.
MICROWAVE LANDING SYSTEM FLARE SUBSYSTEM TEST Data Report, period ending Apr. 1979
Carl B. Jezierski Oct. 1981 43 p refs
(FAA Proj. 075-725-420)
(AD-A107327; FAA-CT-81-61) Avail: NTIS HC A03/MF A01 CSCL 17/7

Microwave Landing System (MLS) Flare subsystem performance data were collected on a specially instrumented Federal Aviation Administration (FAA) Technical Center aircraft. The airborne data were compared with a theodolite tracking system reference and error plots generated. Due to extensive lightning damage only two flight tests were performed. Flare subsystem accuracy could not be determined because of insufficient data. Author (GRA)

N82-27264# Federal Aviation Administration, Atlantic City, N.J.
HIGH-SPEED ROTARY PRINTING DEVICE FOR AIR TRAFFIC CONTROL APPLICATIONS: A PRELIMINARY EVALUATION Final Report, Aug. 1980 - Apr. 1981
Gerard Spanier Oct. 1981 16 p
(AD-A107325; FAA-CT-81-59; FAA/RD-81/73) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report describes a unique, high-speed rotary printing device evaluated by the Federal Aviation Administration (FAA) Technical Center to determine potential applicability in air traffic control (ATC) work stations. The report discusses general performance of the unit, basic ATC operational problems being addressed by the study, concepts of application, and future activities for more comprehensive evaluations in simulated and real work station environments. Author (GRA)

N82-27265# Federal Aviation Administration, Atlantic City, N.J.
SURVEILLANCE SIMULATION TESTING OF TERMINAL AND EN ROUTE MODE S SENSORS Interim Report, Apr. - Aug. 1980
Robert B. Frack Jan. 1982 66 p
(FAA Proj. 034-241-510)
(AD-A112250; DOT/FAA/CT-81/16) Avail: NTIS HC A04/MF A01 CSCL 17/7

A test and evaluation (T&E) was conducted to determine the surveillance characteristics of the Mode S (formerly the Discrete Address Beacon System (DABS) en route and terminal sensors operating with effective receive beam widths of 2.4 deg. and 3.4 deg. The tests were conducted at the FAA Technical Center for terminal and enroute Mode S configurations having maximum ranges of 60 and 200 nautical miles (nmi), respectively. Surveillance loading was simulated using an aircraft reply and interference environment simulator (ARIES) to provide Mode S, Air Traffic Control Radar Beacon System (ATCRBS), or a mixture of the two types of aircraft. Surveillance characteristics were measured by determining the percent detection, blip scan ratio, Mode 3/A and C reliability, Mode S identifier (ID) reliability, and the number of replies per report or interrogations per scan for both types of aircraft. It was concluded that increasing the effective receive beam width had negligible impact on the surveillance characteristics of either sensor operating with simulated Mode S targets. Increasing the effective receive beam width improved the percent detection and Mode C reliability for both sensors operating with simulated ATCRBS targets. GRA

N82-27266# Federal Aviation Administration, Atlantic City, N.J.
MODE S SYSTEM ACCURACY Final Report, Jun. - Oct. 1980
Clifford Chapman and Joseph J. Brady Feb. 1982 69 p refs
(FAA Proj. 034-241-510)
(AD-A112249; FAA-CT-81-67; FAA-RD-81-90) Avail: NTIS HC A04/MF A01 CSCL 17/7

A series of flight tests were performed using three Mode S (formerly the Discrete Address Beacon System (DABS)) sensors for the purpose of determining the capability of each sensor in reporting the true position of an aircraft. For both the Mode S and the Air Traffic Control Radar Beacon System (ATCRBS) mode of operation, slant range, and azimuthal position data, as reported by each sensor, were compared to positional data collected concurrently by a precision range instrumentation system at the Federal Aviation Administration (FAA) Technical Center. GRA

N82-27267# Federal Aviation Administration, Atlantic City, N.J.
DESIGN AND IMPLEMENTATION OF EFFICIENT ALGORITHMS FOR AUTOMATIC DETERMINATION OF CORRECTED SLANT RANGE Final Report
D. W. Stout and R. G. Mulholland Feb. 1982 22 p refs
(FAA Proj. 975-200-10A)
(AD-A112248; FAA-CT-81-30) Avail: NTIS HC A02/MF A01 CSCL 17/7

This report introduces a systematic approach to the design of algorithms for evaluating the corrected slant range in a radar surveillance system. Applications include air traffic control (ATC) operations requiring real-time continuous comptutation for a multitude of targets without overtaxing available computational resources. From the point of view of accuracy, utilization of memory, and computational speed, the design technique is capable of providing an algorithm that is superior to the corrected slant range technique presently employed in the National Airspace System (NAS). Author (GRA)

N82-27268# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
TERMINAL AIR TRAFFIC CONTROL WITH SURVEILLANCE DATA FROM THE MODE S SYSTEM: RESULTS OF SYSTEM DEMONSTRATIONS TO FIELD CONTROLLERS Final System Demonstration Report, period ending May 1981
Verne Tallio and Haim Gabrieli Feb. 1982 76 p refs
(Contract DTFA01-81-C-10001)
(AD-A112632; MTR-81T7; DOT/FAA/CT-82/11) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report describes the results of a series of system demonstrations of a modified version of the ARTS III system (ADS2) which was developed to operate with target reports provided by the Mode S system. The demonstrations were conducted at the FAA Technical Center with field controllers from the Philadelphia ARTS III facility. The report contains a compilation of the controllers' opinions and comments on the operational characteristics of the new system. This demonstration cannot be considered a comprehensive test and evaluation effort; however, with regard to those system capabilities which were demonstrated, the controllers found no major technical or operational obstacles which would impact the system implementation in an operational environment. Author (GRA)

N82-27269# RAND Corp., Santa Monica, Calif.
AUTOPILOT: A DISTRIBUTED PLANNER FOR AIR FLEET CONTROL Interim Report
Perry W. Thorndyke, David McArthur, and Stephanie Cammarata Jul. 1981 34 p refs
(Contract MDA903-78-C-0029; ARPA Order 3460)
(AD-A107139; RAND/N-731-ARPA) Avail: NTIS HC A03/MF A01 CSCL 17/7

Distributed planning requires both architectures for structuring multiple planners and techniques for planning, communication, and cooperation. We describe a family of systems for distributed control of multiple aircraft, in which each aircraft plans it own flight path and avoids collisions with other aircraft. AUTOPILOT, the kernel planner used by each aircraft, comprises several processing experts that share a common world model. These experts sense the world, plan and evaluate flight paths, communicate with other aircraft, and control plan execution. We

discuss four architectures for the distribution of airspace management and planning responsibility among the several aircraft occupying the airspace at any point in time. The architecture differ in the extent of cooperation and communication among aircraft. Author (GRA)

N82-27270# RAND Corp., Santa Monica, Calif.
SCENARIOS FOR EVOLUTION OF AIR TRAFFIC CONTROL
Robert Wesson, Kenneth Solomon, Randall Steeb, Perry W. Thorndyke, and Keith Wescourt Nov. 1981 82 p refs
(Contract MDA903-81-C-0211)
(AD-A112566; RAND/R-2698-FAA) Avail: NTIS HC A05/MF A01 CSCL 17/7

To accommodate the predicted demand for air traffic service in the year 2000, computer technology must augment human control skills. Preliminary laboratory studies have demonstrated that computer programs can track aircraft, predict their future paths, generate conflict-free clearances, and monitor them for compliance-all automatically. This technology could automate most routine ATC tasks and could change the human role in ATC to that of a system manager. How to make the transition to such a system from the present one and exactly what the future specialist's role would be are the issues addressed by this report. We present three scenarios that delineate a spectrum of transition plans: a Baseline scenario in which the human controller's role is emphasized; and AERA (Automated En Route ATC) scenario in which computers assume the primary control responsibility and perform most ATC functions autonomously; and a Shared Control scenario in which automated, individually invokable modules assist a human specialist who retains the primary responsibility for control. GRA

N82-27271# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
GYRO SYSTEMS (SELECTED PAGES)
D. S. Pelpor 19 Mar. 1982 87 p Transl. into ENGLISH of the mono. "Giroskopicheskiye Sistemy" Moscow, 1971 p 5-12, 97-105, 281-293, 431-436, 475-485
(AD-A113748; FTD-ID(RS)T-1768-81) Avail: NTIS HC A05/MF A01 CSCL 17/7

Operating principles are discussed for: (1) differentiating and integrating gyroscopes; (2) gyrostabilizers; (3) course gyros and gyroscopic sensors of the direction of the true vertical; and (4) inertial systems. Schematics are provided of each of these means for control of aircraft, rockets, and spacecraft as well as of their onboard instruments. A diagram of the layout of gyroscopes on the platform of a three dimensional space gyrostabilizer is included. A.R.H.

N82-27272# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
GRAVITY INDUCED POSITION ERRORS IN AIRBORNE INERTIAL NAVIGATION
Klaus-Peter Schwarz Dec. 1981 60 p refs
(Contract F19628-79-C-0075; AF Proj. 7600)
(AD-A113823; Rept-326; AFGL-TR-82-0030; SR-11) Avail: NTIS HC A04/MF A01 CSCL 17/7

The report investigates the feasibility of improving airborne inertial navigation by use of gravity field approximations which are more accurate than the normal model presently applied. The effect of the anomalous gravity field on positioning is investigated by using a simplified dynamical error model and by deriving analytical expressions for the steady state error via the state space approach. In this approach, changes in the anomalous gravity field are cast into the form of first-order differential equations which are related to a position dependent covariance representation of the gravity field by way of the vehicle velocity. Different possibilities for a state space model of the anomalous field are discussed. The procedure chosen combines the consistency of the T.scherning-Rapp model with the advantages of a formulation in terms of Gauss-Markov processes by making use of the essential parameters of a covariance function proposed by Moritz. The expressions for the gravity induced position errors resulting from this approach are easy to compute for a wide variety of cases. The assumptions made to derive them are in general justifiable. Based on the available gravity field information a number of approximation models are proposed and expressed in terms of equivalent spherical harmonic expansions. Results show that the use of presently available global models would reduce the gravity induced position errors from Sigma = 150 m. Improved global models expected in the near future as for instance those from the GRAVSAT mission, would bring errors below Sigma = 50 m. GRA

N82-27273# Army Missile Command, Redstone Arsenal, Ala. Systems Simulation and Development Directorate.
QUASILINEARIZATION SOLUTION OF THE PROPORTIONAL NAVIGATION PROBLEM
Dale W. Alspaugh (Purdue Univ., West Lafayette, Ind.) and Maurice M. Hallum, III Jun. 1981 24 p refs
(DA Proj. 1L1-62302-A-214)
(AD-A113668; AD-E950227; DRSMI/RD-81-15-TR) Avail: NTIS HC A02/MF A01 CSCL 17/7

An approximate solution is presented in this report for the trajectory of a constant-speed missile following a planar intercept trajectory based on proportional navigation guidance. The technique of quasilinearization is used to generate a sequence of solutions. An explicit solution is developed using the first recursive solution. The accuracy of this solution is discussed in the context of specific sets of parameters. It is shown that this explicit solution provides excellent accuracy over a wide range of intercept trajectories. Author (GRA)

N82-27274# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
DOPPLER TEST RESULTS OF EXPERIMENTAL GPS RECEIVER Final Report
Richard J. Anderle Jan. 1982 64 p refs
(AD-A113587; NSWC/TR-82-01) Avail: NTIS HC A04/MF A01 CSCL 08/5

Three experimental geodetic Global Positioning System Receivers were deployed in the Washington, D. C. area. Analysis of five to six hours of Doppler observations distributed among four satellites yielded relative position coordinates on a 28 km baseline which were repeatable to 30 cm in height, 70 cm in the East directions and to 10 cm in the North directions. Results obtained for a receiver equipped with an oscillator having poorer stability degraded to 50 cm to 1.5 meters. The results confirm simulations that Doppler observations made with the geodetic receiver under development will yield decimeter accuracy in relative position in one to three hours. Since the experimental receivers required about a minute to sequence between satellites, tests could not be performed to test cm precision in relative station positioning which can be obtained by comparing phase observations between satellites with receivers under development. GRA

N82-27275# Naval Coastal Systems Center, Panama City, Fla. Mine Countermeasures Development Div.
A BALANCED ACTIVE ANTENNA AND IMPULSE NOISE BLANKET SYSTEM FOR THE REYDIST T RADIO NAVIGATION RECEIVER
Bobby R. Ludlum Feb. 1982 32 p
(AD-A114074; AD-F200023; NCSC-TM-340-82) Avail: NTIS HC A03/MF A01 CSCL 17/7

Erratic operation of Raydist T radio navigation equipment aboard mine countermeasures helicopters has been traced to fuselage-tow cable interactions with the Raydist receiving antenna and to negative-corona generated impulse noise. The development of a balanced active antenna and an impulse noise blanker which have proved successful in reducing these detrimental effects are described. The final system is described in detail and the results of laboratory tests are presented. Author (GRA)

N82-27276# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM (METCALS) INVESTIGATION Final Report
Robert N. Trebits, Eric S. Stoberg, Raymond B. Efurd, Benjamin Perry, and Mark A. Corbin Feb. 1982 172 p refs
(Contract N00039-80-C-0082)
(AD-A113047; GIT/EES-A-2550-FTR) Avail: NTIS HC A08/MF A01 CSCL 17/7

A television tracker system for the AN/TPN-22 radar was designed, assembled, and delivered. A cursor whose position is

determined by the radar's tracking solution is superimposed on a TV camera image of the aircraft on its landing approach. Alphanumeric data also appear on the display for video tape documentation purposes. Author (GRA)

N82-27277# Mitre Corp., McLean, Va. METREK Div.
THE FLIGHT SERVICE AUTOMATION SYSTEM (FSAS) SYSTEM BENCHMARK. VOLUME 1: SUMMARY, INTRODUCTION AND CONCEPTS
R. G. Nystrom, S. Koslow, and C. R. Spooner Aug. 1981 80 p 4 Vol.
(Contract DTFA01-81-C-10001)
(PB82-143538; MTR-81W131-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 01B

A system benchmarking technology was developed to meet the requirements of an interactive, dedicated application. This methodology is applicable to procurements in which the hardware/operating system configurations are off the shelf and the applications software was not implemented in its eventual form. In this methodology, a model of the application is interfaced with the operating system and is executed, while being driven by a specified load, and performance of the proposed configuration is measured. The requirements of the FSAS application of this system benchmark methodology was documented and is published in the present form to record and the concepts and techniques of the methodology are made available. GRA

N82-27278# Mitre Corp., McLean, Va. METREK Div.
THE FLIGHT SERVICE AUTOMATION SYSTEM (FSAS) SYSTEM BENCHMARK. VOLUME 2: THE MODEL OF THE APPLICATION
C. R. Spooner Aug. 1981 344 p 4 Vol.
(Contract DTFA01-81-C-10001)
(PB82-143546; MTR-81W131-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 01B

Application of a system benchmarking technology is illustrated. The model of the application is described and requirements and guidelines for mapping the model to the proposed configurations, and for selection of options in the model are provided. GRA

N82-27279# Mitre Corp., McLean, Va. METREK Div.
THE FLIGHT SERVICE AUTOMATION SYSTEM (FSAS) SYSTEM BENCHMARK. VOLUME 3: THE VENDOR INTERFACE PACKAGE
C. R. Spooner Aug. 1981 175 p 4 Vol.
(Contract DTFA01-81-C-10001)
(PB82-143553; MTR-81W131-Vol-3) Avail: NTIS HC A08/MF A01 CSCL 01B

The Vendor Interface Package (VIP) for th FSAS system is presented. It provides a standard interface for the model with the proposed system. The VIP requirements and implementation guidelines are given. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-27280*# Operations Research, Inc., Silver Spring, Md.
BENEFIT COST ANALYSIS OF THE AIRCRAFT ENERGY EFFICIENCY PROGRAM Final Report
James Bauchspies, Frank Hopkins, and Lawrence Kaplan Nov. 1980 242 p refs Revised
(Contract NASw-2961)
(NASA-CR-169116; NAS 1.26:169116) Avail: NTIS HC A11/MF A01 CSCL 01C

Analyses were reviewed in light of rapid and dramatic changes in fuel cost and availability, as well as significant changes in the economic and political climate relating to these factors. N.W.

N82-27281# Boeing Commercial Airplane Co., Seattle, Wash. Noise Technology Dept.
AIRCRAFT NOISE REDUCTION
Richard E. Russell and J. M. Streckenbach 1981 15 p Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981
Avail: NTIS HC A02/MF A01

A brief introduction of the Boeing commercial airliner family is followed by a discussion of the significant noise reduction accomplishments for turbine-powered aircraft from the 1950's to the 1980's, with projections of further benefits until the year 2000. Definition of the trades to be made between noise reduction and fuel economy, as well as technical problems yet unsolved, lead to a recognition that the greatest advances in aircraft noise reduction are past, and that significant research will be required in the future to lower noise floors that are presently inhibiting further progress. Emphasis is given to precautions that must be taken in the selection of meaningful fleet noise data to avoid costly and irreversible errors in airport and community planning. T.M.

N82-27282# United Technologies Corp., Stratford, Conn. Sikorsky Aircraft Div.
XH-59A ABC TECHNOLOGY DEMONSTRATOR ALTITUDE EXPANSION AND OPERATIONAL TESTS Final Report, Aug. 1980 - Jun. 1981
A. J. Ruddell Dec. 1981 79 p refs
(Contract DAAK51-80-C-0021; DA Proj. 1L1-62209-AH-76)
(AD-A111114; SER-69072; USAAVRADCOM-TR-81-D-35)
Avail: NTIS HC A05/MF A01 CSCL 01/3

This report presents the results of two flight test programs conducted with the XH-59A Advancing Blade Concept demonstra-configuration, consisted of altitude and center-of-gravity envelope expansion testing. Test results verified the concept of ope expansion testing. Test results verified the concept of developing lift primarily on the advancing rotor blades to dramatically improve lift and speed potential. The XH-59A achieved a maximum speed of 263 knots true airspeed and demonstrated a service ceiling of 25,500 feet. The entire flight envelope was demonstrated without classical retreating blade stall. Rotor loads and stresses and rotor tip clearance followed predicted trends and were controllable. Limited center-of-gravity envelope expansion was accomplished. The second program consisted of operational tests conducted primarily in the nap-of-the-earth and contour flight environments, using both the auxiliary and helicopter propulsion modes. The compact ABC design and smaller rotor diameter enhanced operation in confined areas. Operational test results showed the ABC to be a viable alternative concept for future tactical aircraft. GRA

N82-27283# Army Logistics Evaluation Agency, Cumberland, Pa.
AVIATION MATERIEL COMBAT READY IN-COUNTRY (AMCRIC)
Herman M. Orrell, III Jun. 1981 58 p refs
(AD-A107451) Avail: NTIS HC A04/MF A01 CSCL 15/5

A previous study, titled Aviation Materiel Combat Ready In-Country (AMCRIC), was provided as a basis to develop a concept to preposition Army aircraft in US Army Europe. This study recognized that aircraft are not authorized as war reserve, and that no aircraft are currently included in POMCUS in Europe. To adequately reinforce NATO, some method had to be devised to allow Army aircraft to be immediately available to a deploying combat force. The project considered: (a) Methods available to accomplish prepositioning of Army helicopters and ancillary systems; (b) South Vietnam Army aviation experience in combat; (c) State-of-the-art storage methods by US Government, foreign governments, and commercial contractors; and (d) Major command interfaces within the US Army that will be required to establish a workable concept. The project results were that US Army has the capability to store helicopters for short periods using on-hand resources; and The Vice Chief of Staff, Army, approved a prepositioning concept developed which will store helicopters in USAREUR on a test bed basis using AH-1S helicopters. GRA

N82-27284# Air Force Geophysics Lab., Hanscom AFB, Mass.
RESPONSE OF CLOUD MICROPHYSICAL INSTRUMENTS TO AIRCRAFT ICING CONDITIONS Interim Scientific Report
Morton Glass and Donald D. Grantham 6 Jul. 1981 56 p refs

(AF Proj. 6670)
(AD-A112317; AFGL-TR-81-0192; AFGL-ERP-747) Avail: NTIS HC A04/MF A01 CSCL 01/4

A series of passes on 6 December 1979 through multilayered-supercooled stratiform and stratocumulus clouds by the Air Force Geophysics Laboratory's instrumented C-130E cloud physics research aircraft is used to evaluate a Rosemount Ice Detector. The response of the detector to icing conditions is compared with measurements from a J-W liquid water content meter and the Knollenberg Axial Scattering Spectrometer Probe (ASSP). A procedure to adjust for zero drift of the J-W instrument is developed. Comparison of liquid water measurements from the J-W and from the ASSP indicate that these data are highly correlated and similar in magnitude. A procedure for extracting useful information from the Rosemount Ice detector has been developed. The icing conditions in the cloud systems studied are typical of the range of conditions in winter stratiform clouds. Liquid water (LWC) values of 0.3 g/cu m and median volume diameters of 15 micrometers were most frequently observed. The results of the analysis show that the Rosemount Ice Detector is a sensitive indicator of the fluctuations of liquid water in clouds with LWC not exceeding 0.8 g/cu m -3. Author (GRA)

N82-27285# General Accounting Office, Washington, D. C. Mission and Analysis and Systems Acquisition Div.
REDUCED PERFORMANCE AND INCREASED COST WARRANT REASSESSMENT OF THE MULTIPLE STORES EJECTOR RACK
26 Mar. 1982 6 p refs
(AD-A112776; GAO/MASAD-82-26) Avail: NTIS HC A02/MF A01 CSCL 19/2

The Air Force plans to award a contract in June 1982 for the continued development of an aircraft bomb carrier known as the Multiple Stores Ejector Rack (MSER). The rack, in development since 1976, was intended for use by certain Navy aircraft as well as several aircraft operated by the Air Force. However, we have found that: service interest in a common bomb rack has dwindled and both the Air Force and the Navy are pursuing separate bomb rack developments; some MSER development goals may not be achieved; and other alternatives to MSER have not been fully evaluated; in addition, MSER's estimated development costs have tripled and average unit procurement costs could not be 14 times greater than the cost of the racks now in service; and the development period has more than doubled. The Air Force has basically reduced it MSER requirements to one aircraft, the F-16, and the Navy has all but pulled out of the program. Before authorizing further expenditure of funds for MSER, GAO recommends that the Air Force and Navy Secretaries be required to determine whether a common bomb rack is still needed, whether MSER will meet Air Force and Navy requirements, and whether it is cost effective. GRA

N82-27286# Systems Control, Inc., Palo Alto, Calif.
DEVELOPMENT OF LOW-ORDER MODEL OF AN X-WING AIRCRAFT BY SYSTEM IDENTIFICATION Final Report
James H. Vincent and John W. Bunnell Feb. 1982 103 p refs
(Contract N00014-79-C-0578)
(AD-A113760) Avail: NTIS HC A06/MF A01 CSCL 01/3

The original purpose of this contract was to prepare a flight test plan for the proposed X-wing demonstrator using system identification to extract useful math models from the flight test data. Since the original statement of work was submitted, however, the scope of this study changed. An X-wing program decision has been reached not to carry the Lockheed X-wing configuration to flight test. Therefore, this task was modified to provide a demonstration of the feasibility of using system identification techniques to extract low-order math models from time history data from a detailed X-wing rotor simulation (REXOR). GRA

N82-27287# Transportation Systems Center, Cambridge, Mass.
B-747 VORTEX ALLEVIATION FLIGHT TESTS: GROUND-BASED SENSOR MEASUREMENTS Final Report
D. C. Burnham Jan. 1982 188 p refs
(AD-A113621; DOT-TSC-FAA-81-19; DOT/FAA/RD-81/99) Avail: NTIS HC A09/MF A01 CSCL 20/4

In 1979, a series of B-747 flight tests were carried out to study the wake-vortex alleviation produced by deploying spoilers in the landing configuration. The alleviation achieved was examined by encounters of probe aircraft and by velocity profile measurements made by a ground-based Laser Doppler Velocimeter. For the first time these two types of measurements were analyzed in a way which allowed direct comparison; they showed reasonable agreement. The velocimeter measurements can be used to evaluate the vortex-induced rolling moment on any following aircraft at any separation. The spoiler alleviation was found to be insufficient to assure safe landings of small aircraft at reduced separation behind the B-747. The persistence of the alleviated vortices appears to be due to the wing-tip vortices which dominate the roll-up of the spoiler-alleviated wake. The addition of rapid roll inputs to the spoiler deployment produced much more effective alleviation, but at the expense of an unacceptable ride quality in the generating aircraft. Author (GRA)

N82-27288# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
COMPARISON OF DIFFERENT FIGHTER AIRCRAFT LOAD SPECTRA
Aake Magnusson 1982 16 p refs
(Contract F-INK-82223-77-001-21-001)
(FFA-TN-1982-02) Avail: NTIS HC A02/MF A01

Open hole specimens, made from 3 mm thick aluminum 7075-T6 [3627-48] clad sheet, were subjected to fighter aircraft load spectra. The influence on fatigue life of spectrum variations, e.g., severe negative maneuver loads, maximum load truncation and cycle omission was studied. Six load spectra, including fighter aircraft loading standard for fatigue evaluation (FALSTAFF) and a cycle truncated version of FALSTAFF, containing 9006 cycles per 200 flights, i.e., half the original number, were investigated. Severe negative maneuver loads as well as maximum load truncation reduce the fatigue life. Truncated FALSTAFF produces the same fatigue life as the original sequence. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-27289# Advanced Engineering Lab., Salisbury (Australia).
COMPOSITE FLIGHT TEST BOOM FOR NOMAD N22B AIRCRAFT
N. C. Frost Nov. 1981 20 p refs
(AEL-0086-TM; AR-002-598) Avail: NTIS HC A02/MF A01

The design, analysis and manufacturing processes are described for an instrumentation nose boom for a flight test program on the Nomad aircraft. Author

N82-27290# Naval Ship Research and Development Center, Bethesda, Md. Central Instrumentation Dept.
CORRECTING FOR TURBULENCE EFFECTS ON AVERAGE VELOCITY MEASUREMENTS MADE USING FIVE HOLE SPHERICAL PITOT TUBE PROBES
Robert D. Pierce Feb. 1982 32 p refs
(AD-A112573; DTNSRDC/CID-82/1) Avail: NTIS HC A03/MF A01 CSCL 14/2

A procedure has been developed for correcting five hole spherical pitot tube mean velocity measurements for errors caused by velocity fluctuations associated with turbulent flow. Velocity fluctuations are independently measured with hot film or hot wire anemometers. These data are then applied to expressions derived in this report to accomplish the necessary correction. This procedure applies to the case where the pitot tube responds to average pressure differentials and is not oriented to null the cross velocity components. For the special case of isotropic flow, the results derived in this report show that corrections are not required. Author (GRA)

N82-27291# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
COCKPIT DISPLAY OF TRAFFIC INFORMATION AND THE MEASUREMENT OF PILOT WORKLOAD: AN ANNOTATED

BIBLIOGRAPHY Final Report, 1970 - 1982
Jacqueline T. Rehmann Feb. 1982 62 p
(AD-A113637; DOT/FAA/CT-81/49; DOT/FAA/EM-81/9)
Avail: NTIS HC A04/MF A01 CSCL 01/3

Approximately 80 references relating to pilot workload were selected and summarized as part of the Cockpit Display of Traffic Information (CDTI) studies currently being conducted by the Federal Aviation Administration Technical Center in Atlantic City, New Jersey. A comprehensive search of the scientific literature was conducted using several sources, including books, scientific journals, proceedings of technical meetings, and computerized information retrieval. Specific topics covered on this annotated bibliography, as they related to CDTI and its concomitant workload considerations, are subjective measures, spare mental capacity, primary task measures, and physiological measures.
Author (GRA)

N82-27292# AOA Apparatebau Gauting G.m.b.H. (West Germany).
TORSIONAL STIFFNESS ELEMENT BASED ON COBALT-SAMARIUM MAGNETS Final Report
Rainer Osthermayer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-044; ISSN-0170-1339; Rept-4.1.0032) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14.70

The feasibility of a strapdown turn and bank indicator with an electromagnetic torsional stiffness element based on cobalt samarium permanent magnets was investigated. Characterization of the suitability of this magnetic material in fulfilling design requirements was stressed. Theoretical fundamentals for the tailoring of magnetic heads were reviewed. Cobalt samarium disks were magnetized axially in such a way that over a range of 18 deg a linear relationship between magnetic induction and the axial deviation angle exists. With these magnets, electromagnetic torsional stiffness elements were built in which the torsion constant is adjustable by the current. Alternative torsional stiffness elements with constant magnetization, but specific profiling of the magnets as well as magnets in connection with a specific current were also studied on a model for dynamic applications. Results validate the mechanical torsional stiffness element design and confirm the magnetic properties of cobalt samarium.
Author (ESA)

N82-27293# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
IMPACT OF ADVANCED AVIONICS TECHNOLOGY AND GROUND ATTACK WEAPON SYSTEMS
Feb. 1982 147 p refs Meeting held at Agheos-Andreas, Greece, 19-23 Oct. 1981
(AGARD-CP-306; ISBN-92-835-0310-4) Avail: NTIS HC A07/MF A01

Autonomous operations conducted by day, night, and in adverse weather are associated with a high degree of automation, requiring sensors with high performance and a large data and signal processing capacity. The vulnerability of attack aircraft to the ground to air defense and the excessive workload of the pilot in the guidance of air to ground weapons point to the concept of a generation of fire and forget weapons. For individual titles, see N82-27294 through N82-27308.

N82-27294# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Deputy for Avionics Control.
IMPACT OF ADVANCED AVIONICS AND MUNITIONS TECHNOLOGY ON GROUND ATTACK WEAPONS SYSTEMS IN NIGHT AND ADVERSE WEATHER CONDITIONS
Louis J. Urban *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 4 p (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

Worldwide environmental conditions that may be encountered by fighter pilots are reviewed as well as the capabilities of potential adversaries. Technology efforts and systems developed to improve capability to operate at night and under unfavorable weather conditions discussed include advanced medium range air-to-air missiles, the PAVE TACK system used on the F-4 and F-111 aircraft, and the low altitude navigation and targeting infrared system for night (LANTIRN) which assists the pilot of a single seat aircraft to fly under the weather in night and helps in acquiring targets and readying weapons for launch. To complement LANTIRN, high resolution synthetic aperture tactical radar and millimeter wave radars are under development to improve target recognition, resolution, and navigation. The precision location strike system, imaging infrared Maverick, combined effects bomblets, GATOR air delivered mines, and wide area antiarmor munitions are other developments summarized.
A.R.H.

N82-27295# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AIR-GROUND ATTACK: AXES OF RESEARCH FOR AIRBORNE SYSTEMS [ATTAQUE AIR-SOL: AXES DE RECHERCHE POUR LES SYSTEMES AEROPORTES]
S. Croce-Spinelli *In its* Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 14 p In FRENCH (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

The integration of weapons systems with other airborne systems and equipment is considered from the point of view of operational aspects. Various weapons and their fire control characteristics are classed and the requirements and possibilities offered for meeting them are tabulated. Target acquisition, mission constraints, and versatility of mission are examined. Strapdown inertial guidance, radio altimeters, radar maps, electro-optics, and multiple access transmission networks are discussed. Systems for very low altitude flight and threat evaluation are described.
Transl. by A.R.H.

N82-27296# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
SOME POTENTIAL NOVEL APPROACHES TO THE AUTOMATIC AIRBORNE DETECTION AND IDENTIFICATION OF GROUND TARGETS
J. S. Williams *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 13 p refs (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

Basic sensor processing functions are examined in an effort to establish the type of operation to be conducted optically. If optical techniques are to be used in target detection and identification, interfaces must be minimized in order to reduce the size of the device used, improve reliability and inspectability, and conserve signal power during processing. Topics covered include receiving optics, optical signal decomposition, image preprocessing, display prepreparation, acquisition computation, and range and bearing. Coherent transform optics, holographic methods, optical feedback, real-time processing, and optical bistable devices are discussed as processing elements. Although optical signal processing has considerable potential in airborne target recognition, considerable research is needed in this capability is to be realized. There is a need to support this activity with adequate modelling of the perception capability of the human visual system if information is to properly displayed and then utilized.
A.R.H.

N82-27297# National Aerospace Lab., Amsterdam (Netherlands).
A PLANNING SYSTEM FOR F-16 AIR-TO-SURFACE MISSIONS
P. J. M. Urlings, W. Loeve, and J. Batenburg (Royal Netherlands Air Force, Zeist) *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 6 p refs (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

Recently introduced into the Royal Netherlands Air Force, the F-16 aircraft is to be employed in both air-to-air and air-to-surface operations. Successful air-to-surface mission accomplishment is highly dependent on the avionics system capabilities as navigation, target acquisition, fire control, and weapons delivery. To make use of the full avionic potential, the set-up of its systems requires careful planning and preflight preparation. Checklists must also be prepared for navigation and in-flight system operation. A concept for a mission planning system is presented to provide the F-16 pilot with a tool for performing adequate preparation. Specific F-16 avionic demands on mission planning are summarized and two systems related to this planning

are described. The assembling of F-16 in-flight essentials into a combat mission folder is described. A.R.H.

N82-27298# Hughes Aircraft Co., El Segundo, Calif. Advanced Programs Lab.

PAVE MOVER AIDED INTEGRATED STRIKE AVIONICS SYSTEM

A. J. Mendez, T. A. DuPuis (AFWAL), and J. Boaz *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 6 p refs (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

Methods were developed for specifying targeting sensor performance based on tactics and weapons characteristics alone. Targeting sensor specifications (demand curves) developed in this manner indicate that, for quick reaction, short range attack with precision-guided munitions, single sensors do not generate sufficient confidence (supply curves) to satisfy the required timeliness. This problem is alleviated by treating all sensors as an integrated set - the ISAS concept. New tactics produce sudden encounters which do not always yield a favorable attack geometry, even if the ISAS is able to distinguish the high priority targets in its field of regard. This situation is greatly improved by real-time targeting data from a stand off target acquisition/control system such as Pave Mover. Maximum benefit from the new tactics and weapon delivery concepts is accrued by pairing the complementary capabilities of ISAS and Pave Mover. This combination optimizes the strike effectiveness and survivability of ground attack aircraft which must penetrate to the battlefield and deep interdiction regions. A.R.H.

N82-27299# AEG-Telefunken, Ulm (West Germany).

ADAPTIVE MULTIFUNCTION SENSOR CONCEPT FOR AIR-GROUND MISSIONS

R. P. Mills-Goodlet, D. J. R. Stock, E. G. Woelfle, and C. Hamilton *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 13 p refs (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

The requirements imposed on a radar system it is to be installed in aircraft flying low-level interdiction missions are discussed. A typical low low-level air-ground attack scenario is described together with the various radar techniques and modes that must be employed. Particular attention is given to the nose radar, its antenna, and its integration with other aircraft sensors to form an adaptive multisensor system. The ways in which such a multisensor system can reduce pilot workload are examined. A.R.H.

N82-27300# Naval Air Systems Command, Washington, D. C.

ATTACK AND EN ROUTE AVIONICS FOR IN-WEATHER OPERATIONS

E. B. Beggs, W. F. Ball (Naval Weapons Center, China Lake, Calif.), and N. J. Schneider (Naval Weapons Center, China Lake, Calif.) *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 11 p (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

An increasingly sophisticated and lethal ground threat environment must be countered in large part by technological advances in the avionics of naval attack aircraft. Critical deficiencies exist in the areas of standoff targeting and weapon delivery, defense suppression, equipment reliability, and crew loading. To reduce pilot workload, automated procedures and decision aids must be developed. Technology must be made available for precise navigation, integration of weapon delivery and flight control systems, automatic target recognition, detection avoidance, automatic flight path routing, and secure communications. The ingress and egress phases of naval air missions are discussed as well as the attack phase and defense suppression. Author

N82-27301# Electronique Marcel Dassault, St. Cloud (France).

WEAPON SYSTEM OF A FUTURE ATTACK AIRCRAFT [SYSTEME D'ARME D'UN AVION D'ATTAQUE FUTUR]

B. E. Bortomb *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 11 p refs In FRENCH (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

A hypothetical all-weather air-to-surface weapon system is presented which is adaptable to a single seat aircraft whose weight without armor would be on the order of 4 tons. It would appear that this system requires a precise predesignation of objectives, so that it can then fulfill its mission with good chances of success by day as well as by night, through diverse fogs and relatively important precipitation, conditions which cover 99% of the cases in which it is used. Transl. by A.R.H.

N82-27302# British Aerospace Public Ltd. Co., Preston (England).

ADVANCED TECHNOLOGY AND FIGHTER COCKPIT DESIGN: WHICH DRIVES WHICH?

I. E. Schofield *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 10 p (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

Problems experienced by the ground attack fighter pilot are reviewed, and the design of an acceptable man machine interface in the cockpit in order to ensure maximum head up operation for low level flying is discussed. The present use of automation and CRT displays is reviewed. Problems in the employment of increased automation, direct voice input, and synthetic speech, and their integration into the avionics system are considered. The use of multifunction displays and controls, keyboards, and the more traditional switchery is discussed. J.D.

N82-27303# Army Armament Research and Development Command, Dover, N. J.

DIGITAL IMAGE PROCESSING FOR ACQUISITION, TRACKING, HAND OFF AND RANGING

Robert R. Marinellie and John V. Spangler *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 12 p refs (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

The design, application, and preliminary analysis of flight test results of the AUTO-Q digital image processor for the automatic recognition of targets in reconnaissance images are discussed. The problems of information extraction from and bandwidth reduction in raw sensor data and the way they lead to the evolution of a common preprocessing approach are considered. The image processing tasks involved in target acquisition, tracking, and handoff are described. The basic concepts and algorithms in AUTO-Q are presented, and the volution of three generations of digital hardware described. A description of the electrical and mechanical characteristics of the latest system is presented. J.D.

N82-27304# Marconi Avionics Ltd., Rochester (England). Airborne Display Div.

WIDE ANGLE RASTER HEAD UP DISPLAY DESIGN AND APPLICATION TO FUTURE SINGLE SEAT FIGHTERS

David W. Hussey *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 8 p refs (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

Unconventional optical design capable of the largest practical field of view, around 20 degrees by 30 degrees for the majority of existing fighter cockpits are described. Some auxiliary advantages implicit in the designs are also outlined. Head up displays of this type are currently in development for the USAF LANTIRN program to be flown in the F-16 and A-10. They are also compatible with a wide range of other fighter aircraft. J.D.

N82-27305# Army Night Vision Lab., Fort Belvoir, Va.

ADVANCED TARGET ACQUISITION AND TRACKING CONCEPTS FOR REAL TIME APPLICATIONS

John Thomas Hall *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 7 p refs (For primary document see N82-27293 18-06)

Avail: NTIS HC A07/MF A01

The basic functional requirements for the target acquisition mission based on the sensor input, preprocessing, image segmentation, feature extraction, target detection, and target classification operations are presented. The impact on designing real time tracking algorithms to follow targets through clutter is considered. An advanced tracking concept considering the coupling

of the target detection/classification algorithm with the multimode track is discussed. The thrust for multisensor systems is considered from the synergistic target acquisition point of view. The implementation of smart sensor target acquisition functions is presently limited by hardware capabilities. The advancement in the very high speed dedicated integrated circuit technology will make present advanced algorithms realizable in integrated circuit hardware. The projected needs for real time target acquisition and tracking are considered for the autonomous vehicle. Several approaches are considered for realization of the truly real time target acquisition system in the next decade. J.D.

N82-27306# Rome Air Development Center, Griffiss AFB, N.Y.
TACTICAL SYSTEMS APPROACH TO INTERDICTION OF 2ND ECHELON MOVING TARGETS USING REAL TIME SENSORS
Martin J. Blancalana and Henry J. Mancini (GE, Utica, N.Y.) *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 9 p refs (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

An integrated system architecture for the effective interdiction of second echelon ground forces which are advancing under the cover of intense EW and air defense protection is described. The proposed architecture is based on principles derived from control theory and present practice, and includes the use of advanced air to surface and surface to surface quasi-autonomous attack elements operating in a complementary manner with stand off target acquisition and track sensors. All of the necessary elements of such an advanced architecture are in fact in various stages of development today. Author

N82-27307# Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).
A CONTRIBUTION TO AUTONOMOUS VEHICLE DETECTION BY A MOVING SENSOR
Ralf Kories *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 9 p refs (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

An algorithm capable of detecting autonomously moving vehicles seen by a moving sensor is presented. The detection is based on the analysis of the motion vector field within the field of view. Examples are given as the algorithm determines the motion vector field for translation, rotation, and focal length changes. The use for the autonomous cueing of a moving tank in a landscape environment is described. J.D.

N82-27308# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Avionics Lab.
MULTISENSOR AND MULTIMODE INTEGRATION: A PERSPECTIVE
Harvey M. Paskin *In* AGARD Impact of Advan. Avionics Technol. on Ground Attack Weapon Systems Feb. 1982 6 p refs (For primary document see N82-27293 18-06)
Avail: NTIS HC A07/MF A01

The development of targeting and fire control sensors (radar, television, forward infrared, carbon dioxide lasers, and millimeter wave sensors) is reviewed and their application to weapons systems design discussed. The questions of the number and type of sensor to be used, their physical and functional integration, and the evaluation of system effectiveness are considered. A simple probabilistic approach for examining some of the factors which bear on the questions is presented and a prognosis of the prospects for achieving satisfactory answers is made. Analyses and simulations of various multisensor and multimode options for air to surface missions indicate the potential for significantly reduced operator workload and increased mission effectiveness, especially in diverse weather and countermeasure conditions. These improvements result from systematic and synergistic integration of various sensors and modes, with emphasis on automatic target recognition and information fusion. J.D.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-27309*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
PERFORMANCE DETERIORATION DUE TO ACCEPTANCE TESTING AND FLIGHT LOADS; JT9D JET ENGINE DIAGNOSTIC PROGRAM
W. J. Olsson 22 Jan. 1982 147 p refs
(Contract NAS3-20632)
(NASA-CR-165572; NAS 1.26:165572; PWA-5512-87) Avail: NTIS HC A07/MF A01 CSCL 21E

The results of a flight loads test of the JT9D-7 engine are presented. The goals of this test program were to: measure aerodynamic and inertia loads on the engine during flight, explore the effects of airplane gross weight and typical maneuvers on these flight loads, simultaneously measure the changes in engine running clearances and performance resulting from the maneuvers, make refinements of engine performance deterioration prediction models based on analytical results of the tests, and make recommendations to improve propulsion system performance retention. The test program included a typical production airplane acceptance test plus additional flights and maneuvers to encompass the range of flight loads in revenue service. The test results indicated that aerodynamic loads, primarily at take-off, were the major cause of rub-indicated that aerodynamic loads, primarily at take-off, were the major cause of rub-induced deterioration in the cold section of the engine Differential thermal expansion between rotating and static parts plus aerodynamic loads combined to cause blade-to-seal rubs in the turbine. B.W.

N82-27310*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
CORE COMPRESSOR EXIT STAGE STUDY, VOLUME 6 Final Report, Oct. 1976 - Dec. 1981
D. C. Wisler Dec. 1981 97 p refs
(Contract NAS3-20070)
(NASA-CR-165554; NAS 1.26:165554; GE-R81AEG288) Avail: NTIS HC A05/MF A01 CSCL 21E

Rear stage blading designs that have lower losses in their endwall boundary layer regions were studied. A baseline Stage A was designed as a low-speed model of stage 7 of a 10-stage compressor. Candidate rotors and stators were designed which have the potential of reducing endwall losses relative to the baseline. Rotor B uses a type of meanline in the tip region that unloads the leading edge and loads the trailing edge relative to the baseline rotor A designs. Rotor C incorporates a more skewed (hub strong) radial distribution of total pressure and smoother distribution of static pressure on the rotor tip than those of rotor B. Candidate stator B embodies twist gradients in the endwall region. Stator C embodies airfoil sections near the endwalls that have reduced trailing edge loading relative to stator A. The baseline and candidate bladings were tested using four identical stages to produce a true multistage environment. Single-stage tests were also conducted. The test data were analyzed and performances were compared. Several of the candidate configurations showed a performance improvement relative to the baseline. A.R.H.

N82-27311*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
QCSEE UNDER-THE-WING ENGINE ACOUSTIC DATA
Harry E. Bloomer and Nick E. Samanich May 1982 28 p refs
(NASA-TM-82691; E-972; NAS 1.15:82691) Avail: NTIS HC A03/MF A01 CSCL 21E

Both an over-the-wing (OTW) and an under-the-wing (UTW) experimental engine are discussed. The UTW engine had a variable-geometry fan exhaust nozzle and a variable-pitch fan that provided quick-response reverse thrust capability. An

automatic digital control enabled optimal engine operation under all steady-state conditions as well as during forward and reverse thrust transient operation. The engine was tested at the Engine Noise Test Facility alone and with wind and flap segments to simulate an installation on a short-haul transport aircraft. The engine acoustic configuration was varied to give 14 test configurations. All of the acoustic test results from the UTW program at Lewis are presented as 1/3-octave-band sound pressure level (SPL) tabulations for all of the test points and some narrow-band spectra and 1/3-octave-band data plots for selected conditions. T.M.

N82-27312# Naval Ship Research and Development Center, Bethesda, Md.

PROCEEDINGS OF THE 12TH NAVY SYMPOSIUM ON AEROBALLISTICS, VOLUME 2

14 May 1981 366 p refs Symp. held at Bethesda, Md., 12-14 May 1981 2 Vol.

(AD-A111783) Avail: NTIS HC A16/MF A01 CSCL 20/4

Contents: Current Status of Inlet Flow Prediction Methods; Rotational Flow in a Curved-Wall Diffuser Designed by Using the Inverse Method of Solution of Potential Flow Theory; Aerodynamic Characteristics of a Series of Airbreathing Missile Configurations; Parabolized Navier-Stokes Predictions for Three-Dimensional Viscous Supersonic Flows; Results of a Government and Industry Survey of the Heating Methods Used to Determine Missile Structural Temperatures; Supersonic Combustor Insulation Ablation Analysis and Tests; Computation of Three-Dimensional Viscous Flow over Blunt Lifting Bodies at High Angle of Attack; Computation of Hypersonic Laminar Viscous Flow over a Body with Mass Transfer and/or Spin at Angle of Attack; Three-Dimensional Viscous Shock-Layer Analysis of Laminar or Turbulent Flows in Chemical Equilibrium; Further Development of the Streamline Method for Determination of Three-Dimensional Flow Separation; Comparison of Numerical Results and Measured Data for Smooth and Indented Nosetips; Structural and Electrical Performance Considerations in the Design of Multiband Radomes; and Structural Considerations for the Recovery of Air-to-Air Missiles. GRA

N82-27313# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

FOREIGN OBJECT IMPACT DESIGN CRITERIA, VOLUME 2 Interim Technical Report, 31 Dec. 1977 - 31 Dec. 1978

Albert F. Storace Wright-Patterson AFB, Ohio AFAPL Feb. 1982 73 p refs

(Contract F33615-77-C-5221; AF Proj. 3066)

(AD-A112701; R78AEG180-Vol-2; AFAPL-TR-78-81-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 21/5

The program objective is to establish specific design criteria and provide the analytical design tools to assess and improve the foreign object damage tolerance of turbine engine fan and compressor blading. This program will aid in the design of more efficient damage-tolerant blading through the replacement of trial and error FOD test and evaluation practices with systematic transient structural analysis methods, test procedures and design criteria. A design system structure was completed and initial versions of the preliminary and final design transient structural response computer programs were developed. In addition, the interface between the bird loading model and the final design response model was completed. Three first stage blades were selected for modeling and testing. Tests and analyses to be used to generate local and gross structural damage design data are in progress and planning was completed for structural element impact tests. Composite and metallic specimens for local and gross damage testing were designed and most of these specimens have been fabricated. A parametric matrix to guide the analyses and validation testing was completed and FOD design criteria goals were formulated for consideration in the program. Author (GRA)

N82-27314# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

FOREIGN OBJECT IMPACT DESIGN CRITERIA, VOLUME 3 Interim Technical Report, 31 Dec. 1978 - 31 Dec. 1979

Albert F. Storace Wright-Patterson AFB, Ohio AFAPL Feb. 1982 134 p refs

(Contract F33615-77-C-5221; AF Proj. 3006)

(AD-A112447; AFAPL-TR-78-81-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 21/5

Specific design criteria were established and the analytical design tools were provided to assess and improve the foreign object damage (FOD) tolerance of turbine engine fan and compressor blading. Efficient, damage tolerant blading is designed by replacing trial and error FOD test and evaluation practices with systematic transient structural analysis methods, test procedures, and design criteria. A design structure was developed for the purposes of providing a consistent framework in which to constitute the design criteria, guiding the overall technical effort, and formulating a data foundation to define the problem environment. The transient-structural-response and interactive-loading models were developed. Local and structural impact testing, material property determination, error band analysis, and the formulation of design criteria were addressed. The properties for the metallic materials were established, and testing is underway to establish the properties for the composite materials. GRA

N82-27315# Virginia Univ., Charlottesville. Dept. of Mechanical Engineering.

THE SCHLADITZ FUEL INJECTOR: AN INITIAL PERFORMANCE EVALUATION WITHOUT BURNING Final Report, 1 Sep. 1977 - 28 Feb. 1979

G. B. Matthews, J. E. Scott, K. A. Harvey, Jr., and J. Z. Colt, Jr. Mar. 1982 96 p refs

(Contract N00014-77-C-0564)

(AD-A113612; UVA/525335/MAE78/101R) Avail: NTIS HC A05/MF A01 CSCL 21/5

The Schladitz Fuel Injector (SFI) is a network of electrically heated, extremely thin metal whiskers. Tests show that very fine fuel droplet sprays are formed leading to substantial improvements in combustion efficiency. Evaluation of this performance potential, however, requires thorough investigation of the flow rate/pressure drop/heating rate influence on spray quality and droplet distribution. Such tests were performed on two SFI geometries with steady flows of Jet A fuel. When these flows were discharged directly to the atmosphere, pressure drop reached a minimum at heating rates of 280 J/cc. At this point, spray quality improved noticeably, showing substantial fog or mist production, which became complete mist as the heating rate approached three-fourths the Jet A enthalpy of vaporization. Similar tests of SFI flows exhausting through conventional spray nozzles showed appreciable improvement in spray quality, producing 50% or more mist at heating rates about one-third less than those required in the absence of nozzles. GRA

N82-27316*# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.

ROTOR FRAGMENT PROTECTION PROGRAM: STATISTICS ON AIRCRAFT GAS TURBINE NGINE ROTOR FAILURES THAT OCCURRED IN U.S. COMMERCIAL AVIATION DURING 1978 Final Report, 1977 - 1978

R. A. DeLucia and J. T. Salvino Sep. 1981 30 p

(NASA Order C-41581-B)

(NASA-CR-165388; NAS 1.26:165388; AD-A113767; NAPC-PE-23) Avail: NTIS HC A03/MF A01 CSCL 21/5

This report presents statistical information relating to the number of gas turbine engine rotor failures which occurred in commercial aviation service use. The predominant failure involved blade fragments, 82.4 percent of which were contained. Although fewer rotor rim, disk, and seal failures occurred, 33.3%, 100% and 50% respectively were uncontained. Sixty-five percent of the 166 rotor failures occurred during the takeoff and climb stages of flight. Author (GRA)

N82-27317# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.

DEVELOPMENT OF ACCELERATED FUEL-ENGINES QUALIFICATION PROCEDURES METHODOLOGY, VOLUME 1 Interim Report, Oct. 1980 - Sep. 1981

J. A. Russell, J. P. Cuellar, Jr., J. C. Tyler, J. Erwin, W. K. Knutson, R. A. Alvarez, R. L. Stenberg (Army Aviation Research and Development Command), F. O. Zimmer (Army Aviation Research and Development Command), R. L. Renta (Mueller Associates, Inc.), and T. J. Timbario (Mueller Associates, Inc.)

Dec. 1981 216 p refs 2 Vol.
(Contracts DAAK70-81-C-0209; DAAK70-80-C-0001; DAAK70-82-C-0001; DA Proj. 1L2-63104-D-150)
(AD-A113461; AFLRL-144-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 15/5

Activities and findings are reported for a 12-month program aimed at the development of procedures for accelerating the qualification of new fuels on Army equipment, emphasizing those derived from oil shale and coal. Prinicpal activities were identification of key tactical and combat surface and air vehicles, powerplants, and fuels systems components; identification of critical properties peculiar to new fuels anticipated to have significant impact upon Army materiel; laboratory evaluations of materials compatibility and fuels characteristics (including lubricity, elastomer compatibility, thermal stability, and corrosion); full-scale fuel systems component testing, and an overall review and evaluation of existing engine/fuel system qualification procedures. Conclusions and recommendations are presented in terms of methodology and criteria which will realistically address key peculiarities of altnerative fuels and thus serve to accelerate their qualification for field Army use. Author (GRA)

N82-27318# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
DEVELOPMENT OF ACCELERATED FUEL-ENGINES QUALIFICATION PROCEDURES METHODOLOGY. VOLUME 1: APPENDICES Interim Report, Oct. 1980 - Sep. 1981
J. A. Russell, J. P. Cuellar, Jr., J. C. Tyler, J. Erwin, R. A. Alvarez, W. K. Knutson, R. L. Stenberg (Army Aviation Research and Development Command), F. O. Zimmer (Army Aviation Research and Development Command), R. L. Rentz (Mueller Associates, Inc.), T. J. Timbario (Mueller Associates, Inc.) et al Dec. 1981 438 p 2 Vol.
(Contracts DAAK70-81-C-0209; DAAK70-82-C-0001; DAAK70-80-C-0001)
(AD-A113532; AFLRL-144-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 15/5

Aircraft engine component listings are included, along with elastomer swell and hardness data and retention properties. Several shale oil fuel test plans are presented. Pre and post test definition data, spot calibration, flow test, fuel characteristics, lubricity and interfacial tension data are also given. Component test results, disassembly and inspection, identification of critical fuel system components, and existing engine qualification procedures are also included. S.L.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-27319*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
QUIET SHORT-HAUL RESEARCH AIRPLANE (QSRA) MODEL SELECT PANEL FUNCTIONAL DESCRIPTION
DeLamar M. Watson May 1982 121 p refs
(NASA-TM-84243; A-8915; NAS 1.15:84243) Avail: NTIS HC A06/MF A01 CSCL 01C

The QSRA, when equipped with programmable color cathode ray tube displays, a head up display, a general purpose digital computer and a microwave landing system receiver, will provide a capability to do handling qualities studies and terminal area operating systems experiments as well as to enhance an experimenter's ability to obtain repeatable aircraft performance data. The operating systems experiments include the capability to generate minimum fuel approach and departure paths and to conduct precision approaches to a STOLport runway. The mode select panel is designed to provide both the flexibility needed for a variety of flight test experiments and the minimum workload operation required by pilots flying into congested terminal traffic areas. T.M.

N82-27320# Eagle Technology, Inc., Arlington, Va.
RELIABILITY AND MAINTAINABILITY ANALYSIS OF FLUIDIC BACK-UP FLIGHT CONTROL SYSTEM AND COMPONENTS Final Report
William H. Skewis and David R. Keyser Sep. 1981 61 p refs
(Contract N62269-81-M-3047)
(AD-A110496; NADC-80227-60) Avail: NTIS HC A04/MF A01 CSCL 01/4

Fluidic components being used in various aircraft applications are demonstrating extremely high reliability. However, the unique design of new fluidic components results in a very limited failure rate data base and prevents the determination of numerical values of fluidic system reliability at a sufficient confidence level. This report identifies the potential failure modes of typical components used in a Fluidic Backup Flight Control System and establishes their frequencies of occurrence from published test reports. Author (GRA)

N82-27321# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DIGITAL COMMAND AUGMENTATION FOR LATERAL DIRECTIONAL AIRCRAFT DYNAMICS M.S. Thesis
David Atzhorn May 1981 203 p refs
(AD-A107264; AFIT-CI-81-55T) Avail: NTIS HC A10/MF A01 CSCL 09/2

Linear-quadratic sampled-data regulator theory is used to design several Type 0 and Type 1 control laws for lateral-directional aircraft dynamics. Control structures are defined for singular command inputs and for control rate outputs; the former allows for precise following of a command whose integral appears in the state vector, while the latter uses both a difference approximation and the Tustin transform to characterize control rate in the discrete-time domain. Type 0 controllers with control rate restraint and 'equivalent' Type 1 controllers are implemented in a microprocessor-based digital flight control system, and flight tests are conducted using Princeton University's Variable-Response Research Aircraft. The control system, entitled CAS-4, offers four combinations of control: direct (unaugmented) control, Type 0 control with both roll rate/sideslip angle and roll rate/lateral acceleration command combinations, and Type 1 control with roll rate/sideslip angle command. Ground-based hybrid simulation and flight tests results show that major closed-loop response features are unaffected by the choice of sampling rate when sampled-data regulator is used. Consequently, much lower sampling rates than would normally be expected can be used when control laws are derived in this manner (a sampling rate of 10 sps is primarily used in this investigation, though lower sampling rates are investigated as well). The results derived through this investigation and presented herein provide additional evidence that digital flight control through modern control theory will be a practical way of implementing flight control systems in future high performance aircraft. GRA

N82-27322# Systems Research Labs., Inc., Dayton, Ohio.
NOTES ON LATERAL-DIRECTIONAL PILOT INDUCED OSCILLATIONS Final Report, May 1979 - May 1981
Ralph H. Smith Wright-Patterson AFB, Ohio AFWAL Mar. 1982 84 p refs
(Contract F33615-79-C-3620; AF Proj. 2403)
(AD-A113996; AFWAL-TR-81-3090) Avail: NTIS HC A05/MF A01 CSCL 05/8

A method is developed for the assessment of lateral-directional pilot induced oscillation (PIO) tendencies. The method is applicable regardless of the flight control system mechanization. The relations between linear and non-linear system effects on the probability or nature of PIO are discussed. In its simplest form, the method proposed for PIO assessment is very similar to methods currently in use. The principal difference is that quantitative methods are provided for the identification of specific frequencies at which appropriate stability criteria must be satisfied if PIO is not to be a possibility. Based upon analyses in this report, the single axis, bank angle PIO is believed to be the most commonly encountered lateral-directional PIO. The possibility for pitch only PIO in the longitudinal mode is discussed. The methods of this report are believed to apply to the study of longitudinal PIO. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-27323# General Electric Co., Daytona Beach, Fla. Space Div.

SYSTEM DESCRIPTION-AVIATION WIDE-ANGLE VISUAL SYSTEM (AWAVS) COMPUTER IMAGE Final Report

D. V. Morland and F. A. Michler Orlando, Fla. Naval Training Equipment Center May 1981 93 p refs

(Contracts N61339-76-C-0048; N61339-79-C-0143)

(AD-A111800; NAVTRAEQUIPC-76-C-0048-1) Avail: NTIS HC A05/MF A01 CSCL 05/9

This report provides an overall description of the Aviation Wide Angle Visual System (AWAVS) Computer Image Generator (CIG) System installed at the Naval Training Equipment Center in Orlando, Florida. The report includes descriptions of system functions and capabilities, system hardware and new technology features incorporated in the CIG System design. This revised report includes descriptions of additions to original CIG which are identified by margin bars. Also, the AWAVS name has been changed to Visual Technology Research Simulator, VTRS.

Author (GRA)

N82-27324# Canyon Research Group, Inc., Westlake Village, Calif.

REPORTS BY SYSTEMS TECHNOLOGY, INC., IN SUPPORT OF CARRIER-LANDING RESEARCH IN THE VISUAL TECHNOLOGY RESEARCH SIMULATOR Interim Report, 1 May 1980 - 30 Nov. 1981

W. F. Jewell, H. R. Jex, R. E. Magdaleno, and R. F. Ringland Dec. 1981 65 p refs

(Contract N61339-78-C-0060)

(AD-A112466; TR-81-025; NAVTRAEQUIPC-78-C-0060-10) Avail: NTIS HC A04/MF A01 CSCL 01/2

The following work was undertaken: (1) Development of a quasi-random turbulence model. This model was preferred to the one provided initially with the VTRS system because it enabled better analysis of pilot responses to turbulence inputs. The STI model is expected to be appropriate for tasks other than carrier landings and for simulations of other aircraft types. (2) Modification of the T-2C simulation to more closely represent the A-7 and F-18 aircraft. (3) Application and evaluation of STI's Non-Intrusive Pilot Identification Program (NIPIP), which was developed to estimate the pilot's input-output describing function and combined pilot-vehicle performance parameters such as crossover frequency and phase margin by using a time domain model of the pilot and a least-squares identification algorithm. NIPIP functions in real-time and uses a sliding time window to maintain freshness in the data; thus time-varying characteristics in the pilot's control strategy can be measured. GRA

N82-27325# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

COLD REGIONS TESTING OF AN AIR TRANSPORTABLE SHELTER

Stephen N. Flanders Aug. 1981 28 p refs

(DA Proj. 4A7-62730-AT-42)

(AD-A107131; CRREL-81-16) Avail: NTIS HC A03/MF A01 CSCL 13/13

An air-transportable shelter designed and built at CRREL for use in cold regions underwent testing in Hanover, New Hampshire, and Ft. Greely, Alaska. The shelter demonstrated some of its capabilities for mobility by being towed for more than 60 miles behind various vehicles and by being transported on a C-130 cargo airplane, a CH-47 helicopter, and a trailer truck. The shelter proved to be very easy for a crew of two to four to set up in all weather conditions including -40 F cold. However, the gasoline-powered generator, which was a source for space heat as well as electricity, functioned very poorly. Overall, the prototype successfully demonstrated qualities of self-reliance, ease of operation and thermal efficiency.

Author (GRA)

N82-27326# Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.

FIELD TEST OF AN IN STACK DIFFUSION CLASSIFIER ON AN AIRCRAFT ENGINE TEST CELL Final Report, Jun. - Dec. 1980

Dale A. Lundgren and Brian J. Hausknecht Tyndall AFB, Fla. Air Force Engineering and Services Center Apr. 1981 40 p (Grant EPA-R-805762-02-2; AF Proj. 1900)

(AD-A113811; AFESC/ESL-TR-81-21) Avail: NTIS HC A03/MF A01 CSCL 14/2

An in-stack diffusion classifier was field tested at Tyndall Air Force Base, Florida. Particle size distribution measurements were made on the exhaust stream from the engine test cell while running a J75-P17 jet engine. Samples were collected at the test cell exhaust plane using a University of Washington in stack cascade impactor followed, in series, by an in stack diffusion classifier being developed at University of Florida. In addition, total particulate samples were obtained using absolute filters to determine particulate mass concentration in the exhaust gases. Opacity readings of the plume were also taken during sampling. The procedures to collect significant data and the general problems encountered to generate a reasonable estimate of jet exhaust aerosol size distribution using a diffusion classifier are described in this report. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

No abstracts in this category.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-27327# Environmental Research and Technology, Inc., Concord, Mass.

STUDY OF METEOROLOGICAL CONDITIONS ALONG ACTUAL OR PROPOSED REENTRY TRAJECTORIES Final Report, Dec. 1978 - Mar. 1981

Kenneth R. Hardy, David W. Blood, Allan J. Bussey, Hsiao-hua K. Burke, Robert K. Crane, and Shu-Lin Tung Mar. 1981 83 p refs

(Contract F19628-79-C-0007; AF Proj. 627A)

(AD-A107035; AFGL-TR-81-0184) Avail: NTIS HC A05/MF A01 CSCL 22/3

The Air Force Geophysics Laboratory (AFGL) has been tasked by the Space Division (SD) of the Air Force Systems Command to provide meteorological support and analyses in support of the Advanced Ballistic Reentry Systems (ABRES) Program. The primary objectives of the work carried out under this contract by Environmental Research and Technology, Inc. (ERT) have been to assist AFGL in: (1) the design and analyses of experiments to assess the probable error of the AGFL aircraft/radar methodology for characterizing the cloud microphysical environment along a reentry trajectory, (2) the development and testing of improved analytical methods for describing the cloud microphysical environment along a reentry trajectory, and (3) the generation of environmental statistics to be used as input to operations analyses of possible future reentry tests of experiments. Another major portion of the work involved the maintenance and running of many computer programs; these programs have been documented and form a part of this report. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-27328*# National Aeronautics and Space Administration, Washington, D. C.
AUTONOMOUS ANTENNA TRACKING SYSTEM FOR MOBILE SYMPHONIE GROUND STATIONS
K. Ernsberger, G. Lorch, and E. Waffenschmidt Mar. 1982 13 p Transl. into ENGLISH from Symphonie Symp., Centre National d'Etudes Spatiales, Toulouse and Deutsche Forschungs und Versuchsanstalt fuer Luft und Raumfahrt, Cologne, 1980 Symp. held in Berlin, 4-7 Feb. 1980 p 541-552 Original language document announced as N81-23142 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76649; NAS 1.15:76649) Avail: NTIS HC A02/MF A01 CSCL 22D

The implementation of a satellite tracking and antenna control system is described. Due to the loss of inclination control for the symphonie satellites, it became necessary to equip the parabolic antennas of the mobile Symphonie ground station with tracking facilities. For the relatively low required tracking accuracy of 0.5 dB, a low cost, step track system was selected. The step track system developed for this purpose and tested over a long period of time in 7 ground stations is based on a search step method with subsequent parabola interpolation. As compared with the real search step method, the system has the advantage of a higher pointing angle resolution, and thus a higher tracking accuracy. When the pilot signal has been switched off for a long period of time, as for instance after the eclipse, the antenna is repointed towards the satellite by an automatically initiated spiral search scan. The function and design of the tracking system are detailed, while easy handling and tracking results. Author

N82-27329*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
THE PHORETIC MOTION EXPERIMENT (PME) DEFINITION PHASE Final Report
L. R. Eaton and S. L. Neste, ed. (GE, Philadelphia) 14 May 1982 100 p refs
(Contract NAS8-34319)
(NASA-CR-162038; NAS 1.26:162038) Avail: NTIS HC A05/MF A01 CSCL 14B

The aerosol generator and the charge flow devices (CFD) chamber which were designed for zero-gravity operation was analyzed. Characteristics of the CFD chamber and aerosol generator which would be useful for cloud physics experimentation in a one-g as well as a zero-g environment are documented. The Collision type of aerosol generator is addressed. Relationships among the various input and output parameters are derived and subsequently used to determine the requirements on the controls of the input parameters to assure a given error budget of an output parameter. The CFD chamber operation in a zero-g environment is assessed utilizing a computer simulation program. Low nuclei critical supersaturation and high experiment accuracies are emphasized which lead to droplet growth times extending into hundreds of seconds. The analysis was extended to assess the performance constraints of the CFD chamber in a one-g environment operating in the horizontal mode. Author

N82-27330# Avco-Everett Research Lab., Mass.
MAUI OPTICAL TRACKING AND IDENTIFICATION FACILITY TRANSITION PROGRAM Final Technical Report, 1 Aug. 1977 - 31 Jan. 1980
Jamie Chapman and Thomas Reed Griffiss AFB, N.Y. RADC Aug. 1981 152 p
(Contract F30602-77-C-0184; AF Proj. 2296)
(AD-A106997; RADC-TR-81-243) Avail: NTIS HC A08/MF A01 CSCL 22/4

This report summarizes the Maui Optical Tracking and Identification Facility (MOTIF) Transition Program results. A description of the system hardware and software as well as the modifications and system upgrades that were accomplished during the program are presented. The Communications System (CMS) and the Data Transmission System (DTS) tasks represented the major hardware procurements of the MOTIF Transition Program. The CMS has a MODCOMP (MC) II computer system with peripherals and an Analytics TLC-100 Telecommunications Line Controller. A MC IV computer system with peripherals and a Tektronix 4014-1 Graphics Display Terminal comprise the DTS. A MC V system with peripherals constitutes a spare system for both CMS and DTS. The CMS and DTS hardware systems provide the automatic data processing capability and improved communications response time required. They also provide added computer capability for other software enhancements. MOTIF was operated five nights per week, single shift to collect metric, photometric, and LWIR data. Special computer software was developed to process metric and photometric data in support of those operations. On the average and weather permitting, 15 to 30 objects were tracked for metric data with one tasked photometric track per night. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-27331*# Systematics General Corp., Sterling, Va.
COMMUNICATIONS SATELLITE SYSTEMS CAPACITY ANALYSIS Final Report
Larry Browne, Taylor Hines, and Brian Tunstall Jun. 1982 114 p refs
(Contract NAS3-22888)
(NASA-CR-167911; NAS 1.26:167911) Avail: NTIS HC A06/MF A01 CSCL 22B

Analog and digital modulation techniques are compared with regard to efficient use of the geostationary orbit by communications satellites. Included is the definition of the baseline systems (both space and ground segments), determination of interference susceptibility, calculation of orbit spacing, and evaluation of relative costs. It is assumed that voice or TV is communicated at 14/11 GHz using either FM or QPSK modulation. Both the Fixed-Satellite Service and the Broadcasting-Satellite Service are considered. For most of the cases examined the digital approach requires a satellite spacing less than or equal to that required by the analog approach. T.M.

N82-27332# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
KINEMATICS, DYNAMICS, AND ESTIMATION OF RIGID-BODY MOTION USING EULER PARAMETERS (QUATERNIONS)
W. L. Ebert Nov. 1981 59 p refs
(AD-A107537; JHU/APL/TG-1329) Avail: NTIS HC A04/MF A01 CSCL 22/2

This report explores the algebraic and measure-theoretic properties of the Euler parameter (quaternion) representation of the rotation group. A family of probability densities on this group is examined, and schemes for numerical integration and estimation of satellite attitude are presented with numerical examples. An effort has been made wherever possible to deal with nonlinear problems directly rather than linearizing them. Several questions for further research are raised regarding convolutions of densities on the group, Brownian motion, and the statistics of spin and torque vectors considered as stochastic variables. Author (GRA)

N82-27333# Panametrics, Inc., Waltham, Mass.
ANALYSIS OF THE RAM EFFECT OBSERVED WITH ELECTRON ESA ON THE s3-2 SATELLITE Final Report, Nov. 1978 - Nov. 1981
Frederick A. Hanser AFGL Hanscom AFB, Mass. Nov. 1981 17 p refs
(Contract F19628-79-C-0009; AF Proj. 7601)
(AD-A111806; AFGL-TR-81-0337) Avail: NTIS HC A02/MF A01 CSCL 20/8

A parallel plate electrostatic analyzer (ESA) to detect 0.08 to 17 keV electrons was launched on the S3-2 satellite in late 1975. Analysis of the low altitude data revealed that the ESA was responding to the neutral atmosphere through a ram effect. The ram effect was confined to attack angles of less than about 30 deg, and was generally present only at the lowest altitudes (250-300 km). By excluding all data with an ESA attack angle of less than 45 deg, completely reliable electron spectra are obtained at all altitudes. Author (GRA)

N82-27334# Auburn Univ., Ala. Dept. of Aerospace Engineering.

ROCKET LAUNCHERS AS PASSIVE CONTROLLERS Final Report

John E. Cochran, Jr., Richard T. Gunnels, and Robert K. McCutchen, Jr. Redstone Arsenal, Ala. Army Missile Command 31 Dec. 1981 108 p refs

(Contract DAAH01-80-C-0523)

(AD-A112571; DRSMI/RL-CR-82-2) Avail: NTIS HC A06/MF A01) A01 CSCL 19/7

A concept is advanced for using the motion of launchers of a free-flight launcher/rocket system which is caused by random imperfections of the rockets launched from it to reduce the total error caused by the imperfections. This concept is called 'passive launcher control' because no feedback is generated by an active energy source after an error is sensed; only the feedback inherent in the launcher/rocket interaction is used. Relatively simple launcher models with two degrees of freedom, pitch and yaw, were used in conjunction with a more detailed, variable-mass model in a digital simulation code to obtain rocket trajectories with and without thrust misalignment and dynamic imbalance. Angular deviations of rocket velocities and linear deviations of the positions of rocket centers of mass at burnout were computed for cases in which the launcher was allowed to move ('flexible' launcher) and was constrained so that it did not rotate ('rigid' launcher) and ratios of flexible to rigid deviations were determined. Curves of these error ratios versus launcher frequency are presented. These show that a launcher which has a transverse moment of inertia about its pivot point of the same magnitude as that of the centroidal transverse moments of inertia of the rockets launched from it can be tuned to passively reduce the errors caused by rocket imperfections. GRA

N82-27335# Computer Sciences Corp., Huntsville, Ala. Defense Systems Div.

EFFECTS OF SAMPLE RATES AND DATA LATENCY ON DIGITAL AUTOPILOTS. VOLUME 1: ANALYSIS SUMMARY Final Report, Jan. - Dec. 1980

A. J. Ventre, J. F. Meadows, W. F. Anderson, J. R. Kennamer, and J. W. Kesting Eglin AFB, Fla. Air Force Armament Lab. Apr. 1981 71 p refs

(Contract F08635-77-C-0292; AF Proj. 2068)

(AD-A112327; AD-E800472; AFATL-TR-81-37-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 09/2

One of the objectives of the USAF Digital Integrating Subsystems (DIS) project is to establish standards for digitally interfacing various guidance options, seekers, autopilots, etc., in future air-to-air and air-to-surface tactical weapons. Since a DIS missiles is digital in nature, time delays and related phase lags are present which affect system stability. This study is an attempt to address the data latency/stability problem. GRA

N82-27336# Mitre Corp., Bedford, Mass.

EVALUATION OF Q-BAND INSTRUMENTATION REQUIREMENTS FOR STRATEGIC SATELLITE SYSTEM (SSS) PROGRAM

D. J. Raponi Dec. 1981 180 p refs

(Contract F19628-81-C-0001; AF Proj. 6340)

(AD-A112698; MTR-8244; ESD-TR-81-393) Avail: NTIS HC A09/MF A01 CSCL 22/2

Q-band instrumentation appropriate for testing the Strategic Satellite System (SSS) satellite terminal is evaluated in terms of current and projected availability; desired and practical measurement capabilities; required development; and schedule/cost impacts to the program. The Air Force is considering several approaches to increasing the strategic communications capability now provided by the recently deployed ultra high frequency (UHF) Air Force Satellite Communications (AFSATCOM) system. The Strategic Satellite System (SSS) was proposed to improve antijam (AJ) characteristics through the use of advanced modulation techniques and higher frequencies (8 and 44 GHz) on links between ground and airborne terminals and the satellites. This report is an assessment of Q-band (44 GHz) test instrumentation requirements, availability, and accuracy as these factors affect cost and schedule for the SSS satellite terminal development program. Though the SSS program has been cancelled, information presented in the report has applicability to the EHF MILSTAR program. GRA

N82-27337# RAND Corp., Santa Monica, Calif.

PACSAT: A PASSIVE COMMUNICATION SATELLITE FOR SURVIVABLE COMMAND AND CONTROL Interim Report

Edward Bedrosian Nov. 1981 35 p

(Contract MDA903-78-C-0281)

(AD-A112414; RAND/N-1780-ARPA) Avail: NTIS HC A03/MF A01 CSCL 22/2

Examines passive COMSATS as alternatives to active COMSATS in the hostile environment that may exist in the postattack period of a nuclear war. Inexpensive, survivable, and jam resistant, they offer an attractive low-data-rate capability. PACSAT is a proliferable candidate for this role. It consists of a long (about 1 km), gravity-gradient-stabilized array of small beads (about 1 cm in diameter) that reflects a narrow, conical, frequency-steerable beam back to the Earth. The properties of PACSAT are presented and its performance in a representative system for the command and control of MX is evaluated. Author (GRA)

N82-27338# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.

AN EXTENDED ALGORITHM FOR THE OCEAN TIDE TERM IN THE FORCE MODEL OF THE COMPUTER PROGRAMS CELEST AND TERRA Final Report

Walter J. Groeger May 1981 33 p refs

(AD-A112278; NSWC/TR-81-48) Avail: NTIS HC A03/MF A01 CSCL 22/3

A revised and extended version if presented of a computer algorithm specifying the gravitational action by which the ocean tides perturb satellite motion. The current ocean tide term in the CELEST and TERRA equations of motion is based entirely on the semidiurnal (M2) tide mode. Also, the corresponding solid earth tide term neglects ocean loading. The present algorithm for the perturbing acceleration caused by the ocean tide re-formulates the M2 tide and introduces ten additional spectral components (S2, N2, K2, K1, O1, P1, Q1, Mf, Mm, Ssa). In addition, the effect on the solid earth of hydrostatic loading by the ocean tide is now included. Author (GRA)

N82-27339# Naval Surface Weapons Center, Dahlgren, Va. Space and Surface Systems Div.

NAVPAC SST DATA PROCESSING-MATHEMATICAL DESCRIPTION Final Report

Everett R. Swift Jul. 1981 50 p refs

(NSWC Proj. 3204)

(AD-A107082; NSWC/TR-81-184) Avail: NTIS HC A03/MF A01 CSCL 12/1

The Navigation Package (NAVPAC) is a satellite-borne data collection system consisting of two sensor subsystems: a receiver/data subsystem capable of tracking up to three Navy Navigation Satellites (NAVSATs) simultaneously and recording Doppler, refraction, and timing information and a miniature electrostatic accelerometer capable of measuring accelerations due to atmospheric drag, winds, and orbit adjust thrusts. This report provides a detailed mathematical description of the NAVPAC satellite-to-satellite tracking (SST) data processing procedures that include preprocessing, preliminary data quality evaluation, and orbit determination. Also included is an overview of the hardware operation required for the correct interpretation of the SST Doppler, refraction and timing data. Author (GRA)

N82-27340# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.

METEOROLOGICAL FACTORS IN HIGH RESOLUTION SATELLITE IMAGERY (DMSP) M.S. Thesis

Mark Evans Schultz Jun. 1981 107 p refs

(AD-A107512) Avail: NTIS HC A06/MF A01 CSCL 09/2

Comparisons of the predicted aerosol size distributions from the Shettle and Fenn, the Munn-Katz, and the Hybrid models are made with aerosol size distribution data sets collected off the California coast near Monterey in April and May, 1980. It is shown that the mixing volume (inversion height) is an important parameter in predictive aerosol distribution equations. The Hybrid model is determined to be inaccurate when compared with the Shettle and Fenn and the Munn-Katz models. The Shettle and Fenn model consistently provided the most accurate results. However, it requires an input of either total particle concentration or visibility, neither of which are easily measured or predicted. The Munn-Katz model is determined to be the most operationally useful of the three models studied. It depends only on the bulk meteorological parameters of wind speed, relative humidity and altitude. The Munn-Katz model neglects mixing volume and advection. The observed data further suggest than an aerosol model which does not include a continental distribution may be more appropriate for the open ocean environment. GRA

N82-27341# Aerospace Corp., El Segundo, Calif. Information Processing Div.
REENTRY VEHICLE NOSETIP DESIGN FOR MINIMUM TOTAL HEAT TRANSFER Final Report
R. L. Baker and R. F. Kramer 15 Apr. 1982 39 p refs
(Contract F04701-81-C-0082)
(AD-A114013; TR-0082(9990)-1; SD-TR-82-25) Avail: NTIS HC A03/MF A01 CSCL 22/2

A direct optimization method has been used to determine fixed fineness ratio nosetip shape contours for a specified vehicle ballistic coefficient; and nosetip scale, which minimize the total trajectory nosetip laminar or turbulent heat transfer. These constraints neglect the interaction of the nosetip shape with vehicle performance characteristics. When this interaction is taken into account and additional new constraints of constant mass and volume are applied, truncated cone nosetips are shown to result in the lowest total nosetip heat transfer. No attempt was made to optimize nosetip shape for the latter constraints.
Author (GRA)

N82-27342# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
AEROSPATIALE: NUMBER 1 IN EUROPE [AEROSPATIALE: NUMERO 1 EN EUROPE]
Luc Guillaud 1981 6 p In FRENCH Presented at Coll. Prospace: Sem. d'Echanges Franco-Indiens sur les Tech. de Pointes, Peking and Tokyo, Dec. 1981
(SNIAS-821-422-103) Avail: NTIS HC A02/MF A01

The activities of the company, Aerospatiale, are reviewed. From the days of the Diamant launch vehicle up to the age of Ariane, the company has led the European field in space systems development. Twenty years of international cooperation are recounted. Projects, such as METEOSAT, INTELSAT 5, and TDF-1, are highlighted. Communication satellites are cited as the present goal of R and D. Author (ESA)

N82-27343# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Subdiv. Systemes.
THE ARIANE LAUNCH VEHICLE AND AUTOMATION [LE LANCEUR ARIANE ET L'AUTOMATIQUE]
Huy Phong Nguyen 1981 18 p In FRENCH Presented at AFCET Congr. Automatique 1981, Nantes, France, 27-29 Oct. 1981
(SNIAS-821-422-106) Avail: NTIS HC A02/MF A01

The automated command and guidance systems on board the Ariane launch vehicle are presented. The functions of the various automatic systems are summarized. Mathematical modeling is explained in terms of control theory. The development of these systems, in particular the guidance and piloting control loops, is reviewed. Hybrid simulation and model tests (wind tunnel; shaker; water tunnel) are considered. Results provide insight into problems of interface. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N82-27344*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
Aug. 1981 42 p refs 7 Vol.
(Contract NAS9-16120)
(NASA-CR-167607; NAS 1.26:167607) Avail: NTIS HC A03/MF A01 CSCL 22A

Service requirements are considered. Topics include development of on-orbit operations scenarios, service equipment summary, crew interaction, and satellite features facilitating servicing. Service equipment concepts are considered. Topics include payload deployment, close proximity retrieval, on-orbit servicing, backup/contingency, delivery/retrieval of high energy payloads, Earth return, optional service, and advanced capabilities. Program requirements are assessed. N.W.

N82-27345*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 2: SATELLITE AND SERVICES USER MODEL Final Report
Aug. 1981 73 p refs 7 Vol.
(Contract NAS9-16120)
(NASA-CR-167608; NAS 1.26:167608; CSS-SSS-RP009) Avail: NTIS HC A04/MF A01 CSCL 22A

Satellite services needs are analyzed. Topics include methodology: a satellite user model; representative servicing scenarios; potential service needs; manned, remote, and automated involvement; and inactive satellites/debris. Satellite and services user model development is considered. Groundrules and assumptions, servicing, events, and sensitivity analysis are included. Selection of references satellites is also discussed. N.W.

N82-27346*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 2A: SATELLITE AND SERVICES USER MODEL, APPENDIX Final Report
Aug. 1981 186 p refs 7 Vol.
(Contract NAS9-16120)
(NASA-CR-167609; NAS 1.26:167609; CSS-SSS-RP009) Avail: NTIS HC A09/MF A01 CSCL 22A

A satellite user model and update are presented. Satellite service needs are assessed. Manned, remote, and automatic involvement are also assessed. N.W.

N82-27347*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 3: SERVICE EQUIPMENT REQUIREMENTS Final Report
Aug. 1981 140 p refs 7 Vol.
(Contract NAS9-16120)
(NASA-CR-167610; NAS 1.26:167610; CSS-SSS-RP009) Avail: NTIS HC A07/MF A01 CSCL 22A

Service equipment mission requirements are discussed. On-orbit operations, satellite classes, and reference missions are included. Service equipment usage and requirements are considered. Equipment identification methodology is discussed. Service equipment usage is analyzed, including initial launch, revisit, Earth return, and orbital storage. A summary of service requirements and equipment is presented, including service equipment status, even interaction, satellite features, and observations. N.W.

N82-27348*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 3A: SERVICE EQUIPMENT REQUIREMENTS, APPENDIX Final Report
Aug. 1981 172 p refs 7 Vol.
(Contract NAS9-16120)
(NASA-CR-167611; NAS 1.26:167611; CSS-SSS-RP009) Avail: NTIS HC A08/MF A01 CSCL 22A

Spacecraft descriptions and mission sequences, mission and servicing operations functional analyses, servicing requirements, and servicing equipment are discussed for five reference satellites: the X-ray Timing Explorer, the Upper Atmospheric Research Satellite, the Advanced X-ray Astrophysics Facility, the Earth Gravity Field Survey Mission, and the Orbiting Astronomical Observatory. N.W.

N82-27349*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 4: SERVICE EQUIPMENT CONCEPTS Final Report
Aug. 1981 112 p refs 7 Vol.
(Contract NAS9-16120)
(NASA-CR-167612; NAS 1.26:167612; CSS-SSS-RP009) Avail: NTIS HC A06/MF A01 CSCL 22A

Payload deployment equipment is discussed, including payload separation, retention structures, the remote manipulator system, tilt tables, the payload installation and deployment aid, the handling and positioning aid, and spin tables. Close proximity retrieval, and on-orbit servicing equipment is discussed. Backup and contingency equipment is also discussed. Delivery and retrieval of high-energy payloads are considered. Earth return equipment, the aft flight deck, optional, and advanced equipment are also discussed. N.W.

N82-27350*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES SYSTEM ANALYSIS STUDY. VOLUME 5: PROGRAMMATICS Final Report
Aug. 1981 112 p refs
(Contract NAS9-16120)
(NASA-CR-167613; NAS 1.26:167613; CSS-SSS-RP009) Avail: NTIS HC A06/MF A01 CSCL 22A

The overall program and resources needed for development and operation of a Satellite Services System is reviewed. Program requirements covered system operations through 1993 and were completed in preliminary form. Program requirements were refined based on equipment preliminary design and analysis. Schedules, costs, equipment utilization, and facility/advanced technology requirements were included in the update. Equipment user charges were developed for each piece of equipment and for representative satellite servicing missions. N.W.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-27351*# Michigan Univ., Ann Arbor.
LONGITUDINAL CONTROL EFFECTIVENESS AND ENTRY DYNAMICS OF A SINGLE-STAGE-TO-ORBIT VEHICLE
Nguyen X. Vinh and Ching-Fang Lin [1982] 94 p refs
(Grant NAG1-86)
(NASA-CR-169119; NAS 1.26:169119) Avail: NTIS HC A05/MF A01 CSCL 22B

The classical theory of flight dynamics for airplane longitudinal stability and control analysis was extended to the case of a hypervelocity reentry vehicle. This includes the elements inherent in supersonic and hypersonic flight such as the influence of the Mach number on aerodynamic characteristics, and the effect of the reaction control system and aerodynamic controls on the trim condition through a wide range of speed. Phugoid motion and angle of attack oscillation for typical cases of cruising flight, ballistic entry, and glide entry are investigated. In each case, closed form solutions for the variations in altitude, flight path angle, speed and angle of attack are obtained. The solutions explicitly display the influence of different regions design parameters and trajectory variables on the stability of the motion. A.R.H.

N82-27352*# National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF COOLING PROPERTIES OF THE GASEOUS MEDIUM OF A SPACE STATION
S. Baranski, R. Blosznyski, M. Hermaszewski, J. Kubiczkowa, A. Piorko, R. Saganiak, Z. Sarol, F. Skibniewski, J. Stendera, and W. Walichnowski Mar. 1982 5 p Transl. into ENGLISH from Postepy Astronaut. (Poland), v. 12, no. 4, 1979 p 81-84 Original document announced as A80-30519 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76794; NAS 1.15:76794) Avail: NTIS HC A02/MF A01 CSCL 22B

An investigation of cooling properties of the gaseous medium was performed in the biosatellite Kosmos-936 as well as in the orbital complexes Soyuz-28/Salyut-6 and Soyuz-30/Salyut-6 with the aid of an especially constructed electric dynamic catathermometer. In this instrument current was measured which was necessary to keep a steady settled temperature of the sensing device. The investigation was performed because of the disturbed heat exhange of the human body caused by lack of natural convection in weightlessness. The instrument also enabled objective estimation of the temperature of the cosmonaut's ody in six optionally selected regions. The results obtained by means of the catathermometer will also enable defining the appropriate hygienic conditions of the gaseous medium of space stations.
Author

N82-27353# Royal Aircraft Establishment, Farnborough (England). Space Dept.
STUDY OF STRAPDOWN INERTIAL OPTICAL SYSTEMS (SIOS) FOR FUTURE ESA SPACECRAFT, VOLUME 1 Final Report
Paris ESA Mar. 1981 202 p refs Prepared in cooperation with British Aerospace Dynamics Group, Bristol, England 2 Vol.
(Contract ESA-3804/78/NL-JS(SC))
(ESA-CR(P)-1549-Vol-1) Avail: NTIS HC A10/MF A01

A baseline (Kalman filter) SIOS, consisting of a set of high performance gyros, two or more star mappers and an onboard processor, is described. Centralized and modular data processing are considered. Control systems are specified and the performance of the attitude measurement and control system, using a Kalman filter, is simulated for low orbit Earth pointing cases and for a celestial target mission. Geostationary mission studies assumed the use of a simple constant gain filter and RF sensor, although results with the baseline system are included. The former approach is adequate, but the autonomy of optical systems is attractive. Kalman filter system performance is impressive for an Earth pointing satellite, and the whole system is immune to high noise levels, but geometrical misalignments limit absolute pointing accuracy. Analysis reveals doubt as to whether the Kalman filter is necessary, although its inclusion is not difficult. Author (ESA)

N82-27354# Royal Aircraft Establishment, Farnborough (England). Space Dept.
STUDY OF STRAPDOWN INERTIAL OPTICAL SYSTEMS (SIOS) FOR FUTURE ESA SPACECRAFT, VOLUME 2 Final Report
Paris ESA Mar. 1981 189 p refs Prepared in cooperation with British Aerospace Dynamics Group, Bristol, England 2 Vol.

(Contract ESA-3804/78/NL-JS(SC))
(ESA-CR(P)-1549-Vol-2) Avail: NTIS HC A09/MF A01

A baseline (Kalman filter) SIOS, consisting of a set of high performance gyros, two or more star mappers and an onboard processor, is described. Centralized and modular data processing are considered. Control systems are specified and the performance of the attitude measurement and control system, using a Kalman filter, is simulated for low orbit Earth pointing cases and for a celestial target mission. Geostationary missions studies assumed the use of a simple constant gain filter and RF sensor, although results with the baseline system are included. The former approach is adequate, but the autonomy of optical systems is attractive. Kalman filter system performance is impressive for an Earth pointing satellite, and the whole system is immune to high noise levels, but geometrical misalignments limit absolute pointing accuracy. Analysis reveals doubt as to whether the Kalman filter is necessary, although its inclusion is not difficult. Author (ESA)

N82-27355# Justus Liebig-Universitaet, Giessen (West Germany). I. Physikalisches Inst.

GROUND TESTS ON THE POSSIBILITY OF CONTROLLING SPACECRAFT CHARGING PHENOMENA VIA ELECTRIC PROPULSION Final Report

K. Bescherer, K. H. Groh, and N. K. Nikolaizig Paris ESA Dec. 1981 227 p refs
(Contract ESA-3639/78/NL-AK)
(ESA-CR(P)-1550) Avail: NTIS HC A11/MF A01

Literature on spacecraft - environment interaction was reviewed; arc discharging of spacecraft in substorm plasma was simulated. The literature shows that geosynchronous satellites can be charged up to thousands of volts. Arc discharging was studied by exposing Teflon, Kapton, Chemglaze, and Nextel samples to electron irradiation, with the RIT 10 ion propulsion system operating or not operating. Charging is controlled by operating the RIT 10 and/or its neutralizer near the samples. Surface potential can be limited to a few hundred volts.
Author (ESA)

N82-27356# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.

SPACEBORNE SUBSYSTEMS AND EQUIPMENT DEVELOPED BY THE BALLISTIC AND SPACE SYSTEMS DIVISION [LES SOUS-SYSTEMES ET EQUIPEMENTS SPATIAUX DEVELOPPES PAR LA DIVISION SYSTEMES BALISTIQUES ET SPATIAUX DE L'AEROSPATIALE]

Luc Guillaud 1981 7 p In FRENCH Presented at Coll. Prospace: Sem. d'Echanges Franco-Indiens sur les Tech. de Pointes, Peking and Tokyo, Dec. 1981
(SNIAS-821-422-104) Avail: NTIS HC A02/MF A01

Hardware developed for such projects as Ariane, Syphonie, METEOSAT, INTELSAT, ARABSAT, TDF-1/TV-Sat, SPOT and others are described including satellite structures such as booms, frames, antennas. Thermal control methods are outlined. Solar generators are covered. Attitude control and pyrotechnics are also discussed. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-27357# Weapons Systems Research Lab., Salisbury (Australia).

ASBESTOS AS A POTENTIAL HEALTH HAZARD IN ROCKET MOTOR TECHNOLOGY

A. Wilkie Sep. 1981 15 p refs
(WSRL-0226-RE; AR-002-620) Avail: NTIS HC A02/MF A01

The presence of airborne asbestos fibers was monitored in areas used for static firing and post firing inspections of rocket motors and the manufacture of rocket motor components containing asbestos. In most locations, the concentration of asbestos fibers was found to be significantly below the present acceptable level in relation to asbestosis but in two areas special procedures are necessary. Fiber and dust removal equipment was installed and additional safety procedures were introduced. Author

N82-27358*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE SPACE SYSTEMS/PROPULSION INTERACTIONS

Jun. 1982 253 p refs Workshop held at Cleveland, 22-23 Oct. 1981
(NASA-TM-82904; E-1288; NAS 1.15:82904) Avail: NTIS HC A12/MF A01 CSCL 22A

Material illustrating the presentations on and the conclusions of workshop panels considering the missions, systems requirements and operations, and systems design and integration is presented. For individual titles, see N82-27359 through N82-27379.

N82-27359*# National Aeronautics and Space Administration, Washington, D. C.

OVERVIEW OF LARGE SPACE SYSTEMS/PROPULSION INTERACTIONS

Richard F. Carlisle *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 1-6 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22A

Large space structure characteristics, antenna controller design, the attitude control system, mission grouping, propulsion system/large space structure interactions, structural mass impact for start transient effects, box truss multiple thrust point effects, and large space structure/propulsion issues are illustrated. J.D.

N82-27360*# General Research Corp., McLean, Va.

NASA SPACE SYSTEM TECHNOLOGY MODEL FUTURE MISSION SYSTEM NEEDS

T. G. Reese *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 7-18 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22A

The overall technology model is outlined and the objectives and descriptions of the primary and secondary propulsion drives presented. The primary propulsion driver missions are the geostationary platform; the coherent optical system of modular imaging collectors (COSMIC); the 100 meter thinned aperature telescope; and the orbiting deep space relay station (ODSRS). The secondary propulsion driver missions are space platform alpha, the space station, and the automated planetary station. J.D.

N82-27361*# Analytic Services, Inc., Arlington, Va.

POTENTIAL LARGE SPACE SYSTEMS MISSION OPPORTUNITIES FOR THE POST 1990'S

R. L. Chase *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 19-24 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22A

Potential mission opportunities outlined and illustrated are

missile defense; space defense; command, control, and communications; defense suppression; force support; space transportation; and orbital support. J.D.

N82-27362*# Aerospace Corp., El Segundo, Calif. 22a
ADVANCED SPACE SYSTEM CONCEPTS AND THEIR ORBITAL SUPPORT NEEDS (1980 - 2000)
J. Butts *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 25-37 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22A

Possible uses of satellite technology up to the year 2000 are suggested and discussed. Included are electronic mail transmission, a personal communications capability, quick location of vehicles or shipments, monitoring of disputed territorial borders, upgraded scientific exploration of the universe, providing better maps of the Earth by remote sensing, space solar power stations and the safe transmission of the electrical energy to Earth, night lighting, and a small personal navigation capability. Support requirements are outlined. L.F.M.

N82-27363*# Analytic Services, Inc., Arlington, Va.
MISSIONS PANEL WORKSHOP SUMMARY
R. L. Chase *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 39-42 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22A

A workshop panel defined missions that would require the potential use of very large, advanced space systems, and ranked them on the basis of need from both a civilian and military perspective. The panel also pointed out those that would need advanced propulsion technology. Surveillance, communications, and defense were given the highest priority, followed by command and control, orbital support, terrestrial support, and space science. L.F.M.

N82-27364*# General Dynamics Corp., San Diego, Calif.
CRYOGENIC ORBIT TRANSFER VEHICLE
W. J. Ketchum *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 43-51 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 21H

Studies determined that shuttle optimized design, allowing the large space system and transfer vehicle in one shuttle flight, greatly reduces transportation costs and minimizes orbital operations. Careful attention to design resulted in efficient payload packaging. A minimum volume, high energy (liquid oxygen and liquid hydrogen) transfer vehicle is described that allows maximum volume for the payload in the orbiter cargo bay. L.F.M.

N82-27365*# Martin Marietta Aerospace, Denver, Colo.
STORABLE ORBIT TRANSFER VEHICLE
W. E. Pipes *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 53-60 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22B

Orbit transfer vehicles (OTV) are evaluated against mission model requirement. Mission suitability of OTVs using storable propellant, cryogenic propellant, and electric propulsion systems is outlined. Energy required, g-level, spacecraft deploy/return, operational constraints, mission duration, and packaging are considered. J.D.

N82-27366*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
ELECTRIC PROPULSION: SYNERGY OF ORBIT TRANSFER AND MAINTENANCE
S. Zafran *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 61-69 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 21C

Electric propulsion systems for transferring large payload masses to geosynchronous Earth orbits and providing accurate on-orbit stationkeeping are evaluated. Orbit boosting, inclination change, attitude control, stationkeeping, relocation, disposal, and power sharing on orbits using electric propulsion are compared with the use of chemical propulsion. J.D.

N82-27367*# General Dynamics Corp., San Diego, Calif.
STRUCTURES: PROPULSION INTERACTIONS AND REQUIREMENTS
C. D. Pengelley *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 71-79 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 21H

The dynamics of the interaction of space structures and their propellant systems are outlined. Optimization for a platform type of space structure is discussed. Static and transient loads, propellant accelerations, tolerances, attitude control, and distributed thrust are considered. J.D.

N82-27368*# Martin Marietta Aerospace, Denver, Colo.
STRUCTURES-PROPULSION INTERACTIONS AND REQUIREMENTS
John Coyner *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 81-86 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 21H

The effects of low-thrust primary propulsion system characteristics on the mass, area, and orbit transfer characteristics of large space systems (LSS) were determined. Three general structural classes of LSS were considered, each with a broad range of diameters and nonstructural surface densities. While transferring the deployed structure from LEO and to GEO, an acceleration range of 0.02 to 0.1 g's was found to maximize deliverable payload based on structural mass impact. After propulsion system parametric analyses considering four propellant combinations produced values for available payload mass, length and volume, a thrust level range which maximizes deliverable LSS diameter was determined corresponding to a structure and propulsion vehicle. The engine start and/or shutdown thrust transients on the last orbit transfer (apogee) burn can impose transient loads which would be greater than the steady-state loads at the burnout acceleration. The effect of the engine thrust transients on the LSS was determined from the dynamic models upon which various engine ramps were imposed. M.G.

N82-27369*# Boeing Aerospace Co., Seattle, Wash.
CENTRALIZED VERSUS DISTRIBUTED PROPULSION
J. P. Clark *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 87-100 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 21H

The functions and requirements of auxiliary propulsion systems are reviewed. None of the three major tasks (attitude control, stationkeeping, and shape control) can be performed by a collection of thrusters at a single central location. If a centralized system is defined as a collection of separated clusters, made up of the minimum number of propulsion units, then such a system can provide attitude control and stationkeeping for most vehicles. A distributed propulsion system is characterized by more numerous propulsion units in a regularly distributed arrangement. Various proposed large space systems are reviewed and it is concluded that centralized auxiliary propulsion is best suited to vehicles with a relatively rigid core. These vehicles may carry a number of flexible or movable appendages. A second group, consisting of one or more large flexible flat plates, may need distributed propulsion for shape control. There is a third group, consisting of vehicles built up from multiple shuttle launches, which may be forced into a distributed system because of the need to add additional propulsion units as the vehicles grow. The effects of distributed propulsion on a beam-like structure were examined. The deflection of the structure under both translational and rotational thrusts is shown as a function of the number of equally spaced thrusters. When two thrusters only are used it is shown that location is an important parameter. The possibility of using distributed propulsion to achieve minimum overall system weight is also examined. Finally, an examination of the active damping by distributed propulsion is described. M.G.

N82-27370*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SYSTEM REQUIREMENTS
R. E. Austin *In* NASA. Lewis Research Center Large Space System/Propulsion Interactions Jun. 1982 p 101-121 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

Requirements of future space systems, including large space systems, that operate beyond the space shuttle are discussed. Typical functions required of propulsion systems in this operational regime include payload placement, retrieval, observation, servicing, space debris control and support to large space systems. These functional requirements are discussed in conjunction with two classes of propulsion systems: (1) primary or orbit transfer vehicle (OTV) and (2) secondary or systems that generally operate within or relatively near an operational base orbit. Three propulsion system types are described in relation to these requirements: cryogenic OTV, teleoperator maneuvering system and a solar electric OTV. M.G.

N82-27371*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SYSTEMS INTEGRATION

James J. Pelouch, Jr. *In its* Large Space Systems/Propulsion Interactions Jun. 1982 p 123-126 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

The workings of systems integration, its accomplishments, the influences of its character changes on the STS, propulsion out of the orbiter and LSS, and technological demands are discussed. The task of systems integration is to define, understand, and account for interactions between the major systems on a space mission. The safety and propulsion systems and their reliability are outlined. E.A.K.

N82-27372*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

GROUND- VERSUS SPACED-BASED ORBITAL TRANSFER VEHICLE

Joe Rehder *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 127-134 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

A space based orbital transfer vehicle (SBOTV) and ground based OTV's (GBOTV) are compared for debris protection, space based OTV maintenance provisions, flight performance, on orbit refueling, and launch and return operations. Debris protection has a severe impact on the SBOTV, while the penalty for the GBOTV is much less severe. A key technology issue is the protection capability of composite materials.On orbit maintenance is critical for SBOTV. Reduction of losses during the various transfers is th maine problem with refueling a SBOTV. Zero-g propellant storage and transfer is an important technology area for SBOTV. A reusable shroud must be developed to return GBOTV's if a Shuttle derivative vehicle is used. The advantage of space basing lies in more efficient use of the launch vehicle. Since most of the mass going to LEO is OTV propellant, and the launches to deliver the SBOTV propellant are generally mass limited, substantially fewer launches are required to support the SBOTV. E.A.K.

N82-27373*# Martin Marietta Aerospace, Denver, Colo.

SYSTEM REQUIREMENTS AND OPERATIONS PANEL WORKSHOP SUMMARY

Fred R. Schwarzberg *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 135-171 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

The low Earth orbit (LEO) versus the geosynchronous Earth orbit (GEO) deployment systems were discussed. The following items are emphasized: (1) large area systems, such as deployment, altitude, orbit transfer, and on orbit operation; (2) propulsion oriented issues such as the orbit transfer vehicle and the auxiliary propulsion systems; (3) programmatic issues. The LEO versus GEO deployment is a significant driver on propulsion requirements for an orbit transfer vehicle. It is suggested that early systems will be deployed at LEO. The Shuttle remote manipulator system (RMS) will not be involved in early demonstration activities. It is concluded that an integrated large space system/propulsion approach is essential and that propulsion development requirements need to be established. E.A.K.

N82-27374*# Martin Marietta Aerospace, Denver, Colo.

THE 100-METER RADIOMETER SPACECRAFT STUDY

H. F. Zimbelman *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 173-197 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

A rigid body analysis of a baseline Large Space System (LSS) which is to function as a radiometer is presented. The LSS is placed in circular orbit about the Earth at an altitude of 650 km, subjected to environmental and vehicle interaction forces and torques, without an active control system of any type on board. The environment forces and torques are gravity gradient, solar radiation, and aerodynamic. Normal operation is in nadir pointing along the Z-local vertical axis. Orbital velocity is assigned to the x-axis of the spacecraft. The analysis is then used to demonstrate the ability or lack of the gravity gradient torques to stabilize the LSS over one complete orbit. Author

N82-27375*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CAPABILITIES IN LARGE SPACE SYSTEMS CONSTRUCTION

Earle M. Crum *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 199-211 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

Orbital construction, demonstration, space construction system analysis, solar power satellite, and space operations are reviewed. Satellite services, holding and positioning aids, and space construction experiments are discussed. N.W.

N82-27376*# Astro Research Corp., Santa Barbara, Calif.

SOME INTERDISCIPLINARY TRADE-OFFS IN THE DESIGN OF LARGE SPACE STRUCTURES

John Hedgepeth *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 213-219 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

The constraints placed on the design of large space structures by acceleration, attitude control, and stationkeeping forces are discussed. Stiffness requirements for the structures are derived. The use of active versus passive accuracy control methods is also addressed. B.W.

N82-27377*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

ACTIVE LARGE STRUCTURES

Keto Soosaar *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 221-237 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

Some performance requirements and development needs for the design of large space structures are described. Areas of study include: (1) dynamic response of large space structures; (2) structural control and systems integration; (3) attitude control; and (4) large optics and flexibility. Reference is made to a large space telescope. B.W.

N82-27378*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

POWER SYSTEMS INTEGRATION

L. W. Brantley *In* NASA. Lewis Research Center Large Space Systems/Propulsion Interactions Jun. 1982 p 239-255 (For primary document see N82-27358 18-20)

Avail: NTIS HC A12/MF A01 CSCL 22B

Power systems integration in large flexible space structures is discussed with emphasis upon body control. A solar array is discussed as a typical example of spacecraft configuration problems. Information on how electric batteries dominate life-cycle costs is presented in chart form. Information is given on liquid metal droplet generators and collectors, hot spot analysis, power dissipation in solar arrays, solar array protection optimization, and electromagnetic compatibility for a power system platform. R.J.F.

N82-27379*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SYSTEM DESIGN AND INTEGRATION PANEL WORKSHOP SUMMARY

C. Carl *In* NASA. Lewis Research Center Large Space

Systems/Propulsion Interactions Jun. 1982 p 257-260 (For primary document see N82-27358 18-20)
Avail: NTIS HC A12/MF A01 CSCL 22A

Priorties are identifiied for spacecraft propulsion system development and for the integration of the propulsion system with various subsystems. Near-term and long-term propulsion technology needs are identified. R.J.F.

N82-27380# Naval Weapons Center, China Lake, Calif. Aerothermochemistry Div.
TURBULENT MIXING AND COMBUSTION OF MULTI-PHASE REACTING FLOWS IN RAMJET AND DUCTED ROCKET ENVIRONMENT Annual Report, Apr. 1980 - Sep. 1981
Klaus C. Schadow, Myung-Jae Lee, and Ken J. Wilson Sep. 1981 7 p
(Grant AFOSR-MIPR-81-00036; AF Proj. 2308)
(AD-A112374; AFOSR-82-0150TR) Avail: NTIS HC A02/MF A01 CSCL 21/5

An axisymmetric, 12.5 cm (5 inch) diameter laboratory ramjet combustor was built and checked out. Experiments were started to determine detailed flow data relevant to gas generator ramjets. Combustion temperature and species concentrations profiles indicate a significant effect of reaction kinetics and mixing on combustion in the beginning of the mixing region downstream of the gas generator nozzle. Comparison of the experimental data with model predictions by Science Application, Inc. was initiated. For the velocity and turbulence intensity measurements, data linkage between the two-color, three-beam laser doppler velocimeter and the computer was established and measurements were started. Author (GRA)

N82-27381# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
A CLASSICAL TRAJECTORY CALCULATION OF THE O + H2 YIELDS OH + H CROSS SECTIONS
Bernard R. Johnson 12 Apr. 1982 28 p refs
(Contract F04701-81-C-0082)
(AD-A114065; TR-0082(2407-06)-1; SD-TR-82-20) Avail: NTIS HC A03/MF A01 CSCL 21/8

State-to-state cross sections for the reaction O+H2(v,j) yields OH(v,j) + H are calculated by classical trajectory methods. The collision velocity and the initial vibration--rotation quantum numbers are chosen to be compatible with the values these parameters would have in a high-altitude missile plume-atmosphere interaction. The computed results are least squares fit to functional forms to provide simple working formulas for the cross sections. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-27382*# Massachusetts Inst. of Tech., Cambridge. Materials Processing Center.
THE MATERIALS PROCESSING RESEARCH BASE OF THE MATERIALS PROCESSING CENTER Annual Report for FY 1981
Merton C. Flemings 28 Jun. 1982 295 p refs
(Grant NsG-7645)
(NASA-CR-169096; NAS 1.26:169096) Avail: NTIS HC A13/MF A01 CSCL 11G

The investigation and evaluation of materials processing techniques in metals, alloys, polymers, and crystal growth are described. For individual titles, see N82-27383 through N82-27406.

N82-27383*# Massachusetts Inst. of Tech., Cambridge.
CONVECTION IN GRAIN REFINING **c26**
M. C. Flemings and J. Szekely *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 23-46 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

The relationship between fluid flow phenomena, nucleation, and grain refinement in solidifying metals both in the presence and in the absence of a gravitational field was investigated. The reduction of grain size in hard-to-process melts; the effects of undercooling on structure in solidification processes, including rapid solidification processing; and control of this undercooling to improve structures of solidified melts are considered. Grain refining and supercooling thermal modeling of the solidification process, and heat and fluid flow phenomena in the levitated metal droplets are described. J.D.

N82-27384*# Massachusetts Inst. of Tech., Cambridge.
EXPERIMENTAL PROGRAM ON NUCLEATION AND STRUCTURE IN UNDERCOOLED MELTS **c26**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 46-72 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

Undercooling and structural refinements in droplets of molten metal levitated in an induction field and/or by dispersion in a fluid carrier were studied. Nickel base and lower melting point alloys levitated in molten carrier fluids are considered. The dispersion of molten alloy droplets in a high temperature fluid following the procedures developed by Perepezko and co-workers for lower melting point alloys; obtaining a similar dispersion by room temperature mechanical mixing of particles of the metal and solidified liquid carrier; and solidification of single relatively large droplets in a transparent fluid carrier, enabling high-speed temperature measurement of the recalescence and subsequent cooling behavior are described. J.D.

N82-27385*# Massachusetts Inst. of Tech., Cambridge.
THE STRUCTURE AND PROPERTIES OF RAPIDLY SOLIDIFIED HIGH ALLOY ALUMINUM MATERIALS **c26**
N. J. Grant *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 73-78 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

A series of 2024 type aluminum alloys modified by additions of 1 to 2% Li were studied to determine the role of the Cu:Li and the (Cu + Mg):Li ratios on resultant strength, ductility, notch-tensile behavior, and crack propagation rates. Ultrasonically gas atomized powders with quench rates of 10 to 100 thousand degrees/s were atomized in an argon atmosphere, producing yields of powder such that almost 100% was finer than 250 microns. The powders are free of gases and porosity, are quite spherical, have few satellites (adhering fine powder particles) and are of uniform microstructure. Strength properties are such that yield strength is 20% greater than for lithium-free 2024 ingot alloy, tensile strength is 10% greater than that of 2024 ingot material, and ductilities are comparable. In terms of specific strength and specific modulus, these RS 2024-Li alloys are significantly better than IM 2024. Author

N82-27386*# Massachusetts Inst. of Tech., Cambridge.
RAPID QUENCHING EFFECTS IN GLASSY POLYMERS **c27**
F. J. McGarry *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 79-89 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11C

Using a specially constructed microbalance for hydrostatic weighing, density changes in PVC thin film due to rapid quenching through the glass transition temperature were observed. The more severe the quench, the greater the free volume content. Isobaric volume recovery of PVC was also studied by volume dilatometry. Both show aging of relaxing molecular rearrangements taking place as a linear function of logarithmic aging time at room temperature. Distribution of retardation times and Primak's distributed activation energy spectra were applied to the volume recovery data. The concomitant changes in mechanical properties of PVC after quenching were monitored by tensile creep stress-stran to failure rates. All reflect the presence of excess free volume content due to rapid quenching. J.D.

N82-27387*# Massachusetts Inst. of Tech., Cambridge.
DEVELOPMENT OF RAPIDLY SOLIDIFIED OXIDATION RESISTANT ALLOYS **c26**
G. J. Yurek *In its* The Mater. Process. Res. Base of the Mater.

Process. Center 28 Jun. 1982 p 90-93A (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

The development of iron-base alloys that contain low concentrations of expensive and/or strategic metals, but that are very resistant to oxidation at elevated temperatures was investigated. Rapid solidification processing was employed to make alloys that are uniform in composition, that comprise very fine grains < 10 microns and that contain a uniform dispersion of very fine (< 0.5 microns) nonmetallic inclusions. Each of these factors contribute to the oxidation behavior of alloys. The compositional and processing variables that yield the optimum oxidation resistance are described. J.D.

N82-27388*# Massachusetts Inst. of Tech., Cambridge.
LASER MATERIALS PROCESSING FACILITY c36
J. S. Haggerty *In its* The Mater. Process. Res. Base of the Mater. Process Center 28 Jun. 1982 p 95-96 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20E

The laser materials processing facility and its capabilities are described. A CO2 laser with continuous wave, repetitive pulse, and shaped power-time cycles is employed. The laser heated crystal growth station was used to produce metal and metal oxide single crystals and for cutting and shaping experiments using Si3N4 to displace diamond shaping processes. J.D.

N82-27389*# Massachusetts Inst. of Tech., Cambridge.
FLUID FLOW IN CRYSTALLIZATION PROCESSES c76
R. A. Brown *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 97-116 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

Investigations of the interactions of heat, mass, and momentum transport in crystal growth from the melt are described. Studies of the mall-scale floating zone process and on a prototype of the vertical Bridgman growth system were emphasized. In both systems detailed numerical calculations are used to dissect the interplay between fluid convection and dopant segregation. These calculations are based on finite element techniques that make feasible the complete solution of solidification problems which include convection. Other numerical methods were developed for solving thermal models of crystal growth processes with melt/gas menisci and for simulating the microscale instabilities in solidification interfaces. J.D.

N82-27390*# Massachusetts Inst. of Tech., Cambridge.
NUMERICAL MODELING AND OPTIMIZATION OF POLYMER MELT PROCESSING OPERATIONS c27
David Roylance *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 117-119 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11C

The application of finite element computer analyses to polymer flows of the type encountered in melt processing operations is described. A code capable of predicting values of fluid velocity, pressure, shear stress, and temperature at any point within the flow field was developed. As such, is is of value in diagnosing such processing problems as regions of fluid stagnation at which thermal degradation may occur, or regions of excessive shear deformation which lead to thermomechanical damage. It is further able to generate predictions of the forces which must be applied to the melt to achieve the desired flow, and this information is of value in designing processing equipment of optimal efficiency and minimum energy consumption. J.D.

N82-27391*# Massachusetts Inst. of Tech., Cambridge.
STUDIES OF METALS ELECTROPROCESSING IN MOLTEN SALTS c26
D. R. Sadoway *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 120-122 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

Fluid flow patterns in molten salt electrolytes were observed in order to determine how mass transport affects the morphology of the metal deposit. Studies conducted on the same metal, both in aqueous electrolytes in which coherent solid electrodeposits are produced, as well as in transparent molten salt electrolytes are described. Process variables such as current density and composition of the electrolyte are adjusted to change the morphology of the electrodeposit and, thus, to permit the study of the nature of electrolyte flow in relation to the quality of the electrodeposit. J.D.

N82-27392*# Massachusetts Inst. of Tech., Cambridge.
HEAT FLOW CONTROL AND SEGREGATION IN DIRECTIONAL SOLIDIFICATION c76
A. F. Witt, W. M. Rohsenow, and P. K. Houpt *In its* The Mater. Process. Res. Base of Mater. Process. Center 28 Jun. 1982 p 123-154 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

Optimization of the vertical Bridgman technique for growth of electronic materials in single crystal form was investigated. The limitations of the crystal growth configuration were experimentally determined and heat transfer related deficiencies identified. Design of an alternate system was based on the use of heat pipes separated by a gradient region. Heat transfer analyses based on one and two dimensional models indicated the necessity of a flexible gradient zone configuration. Directional melting of binary systems as encountered during seeding in melt growth was analysed for concurrent compositional changes at the crystal-metal interface, and the theoretical treatment numerically applied to HgCdTe and Ga doped germanium. A theoretical and experimental study of the thermal effects associated with current flow was conducted. It was found that experimental measurements of dc induced growth during crystal pulling can be used for the precise determination of the Peltier coefficient. J.D.

N82-27393*# Massachusetts Inst. of Tech., Cambridge.
ADAPTIVE MATERIALS PROCESSING c37
T. W. Eager *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 155-158 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 13I

New sensors for both arc welding and resistance spot welding processes were studied. For arc welding, the arc itself is used as the sensor. Minor changes in both composition and geometry of the plasma result in fluctuations in the arc voltage. While the process as currently employed is an off-line system, development of an on-line process controller would be possible once the optimum analysis technique is developed. It has been shown that for resistance spot welding, the dynamic resistance of the weld joint can be correlated to growth of the fusion zone. It is indicated that this technique is not as useful for projection welds as for spot welds. E.A.K.

N82-27394*# Massachusetts Inst. of Tech., Cambridge.
RAPID SOLIDIFICATION PROCESSING c76
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 159-174 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

Rapid solidification in materials was studied. Crystalline and noncrystalline metals, polymers, ceramics, solidification mechanism and resulting structure, innovative processing techniques, properties and applications are investigated. The following programs are outlined: alloys which offer high strength at elevated temperatures, and processing methods necessary to achieve these goals; structure and structure property relations in ferrous alloys; Corrosion related aspects and high temperature oxidation resistance of fine grained alloys; relation of solidification theory to structures produced, on innovative processes for rapid solidification, and on solidification at high undercoolings. Studies on rapid solidification of polymeric materials are demonstrated. E.A.K.

N82-27395*# Massachusetts Inst. of Tech., Cambridge.
IRRADIATION EFFECTS IN RAPIDLY AND CONVENTIONALLY SOLIDIFIED ALLOYS. PHASE STABILITY IN RAPIDLY SOLIDIFIED N I-Nb UNDER Ni ION IRRADIATION c26
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 175-184 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

Two alloy compositions in the Ni-Nb system (Ni60Nb40 and Ni85Nb15) were produced by rapidly quenching from the melt

with the piston anvil technique. The Ni60Nb40 was transformed to a metastable, partially crystalline state by heat treatment in a differential scanning calorimeter. The Ni85Nb15 was fully crystalline, with the majority of the grains composed of collections of primary dendrite arms. Both compositions were irradiated with 4 MeV Ni++ ions. The irradiation induced microstructures were examined by transmission electron microscopy and compared with thermally aged samples. The thermal evolution was arrested by ion irradiation in the temperature range studied, by inhibiting the nucleation of the NiNb phase. No irradiation induced voids were observed. It is found that the ion irradiation drives the microstructure along a different path than thermal evolution.
E.A.K.

N82-27396*# Massachusetts Inst. of Tech., Cambridge.
EFFECT OF PROCESSING ON POLYMER/COMPOSITE STRUCTURE AND PROPERTIES **c24**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 185-197 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11D

Advances in the vitality and economic health of the field of polymer forecasting are discussed. A consistent and rational point of view which considers processing as a participant in the underlying triad of relationships which comprise materials science and engineering is outlined. This triad includes processing as it influences material structure, and ultimately properties. Methods in processing structure properties, polymer science and engineering, polymer chemistry and synthesis, structure and modification and optimization through processing, and methods of melt flow modeling in processing structure property relations of polymer were developed. Mechanical properties of composites are considered, and biomedical materials research to include polymer processing effects are studied. An analysis of the design technology of advances graphite/epoxy composites is also reported. E.A.K.

N82-27397*# Massachusetts Inst. of Tech., Cambridge.
LASER PROCESSING **c27**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 198-209 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11C

Progress in the Progress ceramic materials is reported. Experiments and models for sintering and microstructure evolution are described. Models and data for understanding the kinetics of grain boundary motion and of pore coarsening and new materials for fuel cells and batteries; are developed. New experimental techniques using lasers for forming fine, monosized powders and for forming stable and metastable structures from liquids, and solar materials research are also developed. Colloidal science and ceramics processing are explored; and research programs on the presintering science necessary for controlled green microstructures are outlined. E.A.K.

N82-27398*# Massachusetts Inst. of Tech., Cambridge.
MODELING OF MATERIALS SUPPLY, DEMAND AND PRICES **c83**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 210-216 refs Sponsored by Bureau of Mines and NSF (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 05C

The societal, economic, and policy tradeoffs associated with materials processing and utilization, are discussed. The materials system provides the materials engineer with the system analysis required for formulate sound materials processing, utilization, and resource development policies and strategies. Materials system simulation and modeling research program including assessments of materials substitution dynamics, public policy implications, and materials process economics was expanded. This effort includes several collaborative programs with materials engineers, economists, and policy analysts. The technical and socioeconomic issues of materials recycling, input-output analysis, and technological change and productivity are examined. The major thrust areas in materials systems research are outlined. E.A.K.

N82-27399*# Massachusetts Inst. of Tech., Cambridge.
WELDING RESEARCH **c37**
In its The Mater. Process. Res. Base of the Mater. Process Center 28 Jun. 1982 p 217-277 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 13I

Welding fabrication and welding processes were studied. The following research projects are reported: (1) welding fabrication; (2) residual stresses and distortion in structural weldments in high strength steels; (3) improvement of reliability of welding by in process sensing and control (development of smart welding machines for girth welding of pipes); (4) development of fully automated and integrated welding systems for marine applications; (5) advancement of welding technology; (6) research on metal working by high power laser (7) flux development; (8) heat and fluid flow; (9) mechanical properties developments. E.A.K.

N82-27400*# Massachusetts Inst. of Tech., Cambridge.
SOLIDIFICATION PROCESSING **c26**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 228-240 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

The solidification processing activities are reported. The following topics are studied: behavior of semisolid metals, purification and strengthening by fractional melting, continuous casting, control of ingot surface quality, and metal matrix composites. Formation of deoxidation products in steels is also investigated. Rapid solidification, crystal growth, experimental and mathematical modeling of solidification processes are explored.
E.A.K.

N82-27401*# Massachusetts Inst. of Tech., Cambridge.
MATHEMATICAL AND PHYSICAL MODELLING OF MATERIALS PROCESSING
In its The Mater. Process. Res. base of the Mater. Process. Center 28 Jun. 1982 p 233-240 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11G

Mathematical and physical modeling of turbulence phenomena in metals processing, electromagnetically driven flows in materials processing, gas-solid reactions, rapid solidification processes, the electroslag casting process, the role of cathodic depolarizers in the corrosion of aluminum in sea water, and predicting viscoelastic flows are described. J.D.

N82-27402*# Massachusetts Inst. of Tech., Cambridge.
ELECTRO PROCESSING RESEARCH **c26**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 241-244 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

Electroprocessing which is concerned with fluid dynamics of the electroreduction process to determine how it may be modified to improve the quality of the deposit was studied. Experimental techniques are used in this research. These techniques include laser Schlieren photography, laser Doppler velocimetry, and frequency spectrum analysis. Projects involve fluid flow studies of zinc plating in aqueous and molten salt electrolytes, study of cell design for magnesium chlorides electrolysis, digital signal analysis of manganese electrodeposition in molten chlorides, and electroplating of molybdenum from low melting salts. It is anticipated that the use of refractory metals as constructed materials in engineering will increase. Their electrodeposition from molten salt electrolytes is important in the extraction metallurgy of refractory metals. E.A.K.

N82-27403*# Massachusetts Inst. of Tech., Cambridge.
SEMICONDUCTOR PROCESSING **c76**
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 245-259 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

The primary thrust of the semiconductor processing is outlined. The purpose is to (1) advance the theoretical basis for bulk growth of elemental and compound semiconductors in single crystal form, and (2) to develop a new experimental approaches by which semiconductor matrices with significantly improved crystalline and chemical perfection can be obtained. The most advanced approaches to silicon crystal growth is studied. The projected research expansion, directed toward the capability of

growth of 4 inch diameter silicon crystals was implemented. Both intra and interdepartmental programs are established in the areas of process metallurgy, heat transfer, mass transfer, and systems control. Solutal convection in melt growth systems is also studied. E.A.K.

N82-27404*# Massachusetts Inst. of Tech., Cambridge.
ELECTRONICS MATERIALS RESEARCH c33
In its The Mater. Process Res. Base of the Mater. Process. Center 28 Jun. 1982 p 23-46 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 09C

The electronic materials and is aimed at the establishment of quantitative relationships underlying crystal growth parameters, materials properties, electronic characteristics and device applications. The overall program evolves about the following main thrust areas: (1) crystal growth novel approaches to engineering of semiconductor materials; (2) investigation of materials properties and electronic characteristics on a macro and microscale; (3) surface properties and surface interactions with the bulk and ambients; (4) electronic properties controlling device applications and device performance. E.A.K.

N82-27405*# Massachusetts Inst. of Tech., Cambridge.
METALS PROCESSING c26
In its Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 268-284 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

The metals processing effort is directed towards improvement of performance and usefulness of materials through modification and control of shape and internal structure. Interaction of reactive gases, introduced into a plasma arc, with iron alloys were analyzed. The technology of magnesium production was assessed. The study of fast fluidized bed reactors is continued. Aspects of separation processes are being investigated. The development of high field superconducting composites for use in large magnetic fusion devices is also discussed. Processing, structure, and property relationships of superconducting materials and the substitution of precious metals in standard electrical contact and connector applications are tested. The influence of processing procedures on the structure of zircaloy and nickel base alloys with a goal of improving mechanical properties and performance is investigated. Investigation of the potential of metal insulator semiconductor junctions as photovoltaic devices is reported. E.A.K.

N82-27406*# Massachusetts Inst. of Tech., Cambridge.
TECHNOLOGY TRANSFER AND INTERNATIONAL DEVELOPMENT: MATERIALS AND MANUFACTURING TECHNOLOGY c85
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 285-287 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 05A

Policy oriented studies on technological development in several relatively advanced developing countries were conducted. Priority sectors defined in terms of technological sophistication, capital intensity, value added, and export potential were studied in Brazil, Venezuela, Israel, and Korea. The development of technological policy alternatives for the sponsoring country is assessed. Much emphasis is placed on understanding the dynamics of the sectors through structured interviews with a large sample of firms in the leading manufacturing and materials processing sectors. E.A.K.

N82-27407# Boston Univ., Mass. Dept. of Chemistry.
STRUCTURE AND INTERACTIONS IN ORGANIC AGGREGATES Final Report
Richard H. Clarke 1 Mar. 1982 5 p
(Grant DAAG29-79-G-0032)
(AD-A112643; ARO-10628.8-C; ARO-13066.1-C; ARO-16017.6-C) Avail: NTIS HC A02/MF A01 CSCL 07/3

The research program we have pursued during the past three years of ARO support has been focused on the physical features of organic dimers and higher order aggregates as revealed through the triplet state properties of these complexes. The overall aim of the research effort was to elucidate the structural features of aromatic organic aggregate systems and the interactions which stabilize them, with a view toward understanding the nature of aggregation as it occurs in model systems of importance in photochemistry and photobiology. Author (GRA)

N82-27408# National Bureau of Standards, Washington, D.C. National Measurement Lab.
NATIONAL MEASUREMENT LABORATORY CENTER FOR MATERIALS SCIENCE Annual Report, 1981
John B. Wachtmana, Jr. Nov. 1981 522 p refs
(PB82-142126; NBSIR-81-2408) Avail: NTIS HC A22/MF A01 CSCL 11G

Contents: microstructure of materials; corrosion and chemical stability of materials in service environments; high temperature chemical stability and process chemistry; fracture and deformation mechanisms and analysis; mechanical durability of ceramics and composites; elastic-plastic fracture mechanics; polymer standards for control and equity; tests, standards, and characterization for manufacturing and durability of dental and medical materials; mechanical durability of polymers for design and use; migration and the durability of polymers in use; dielectric and piezoelectric plastics design and performance; structure characterization; synchronization radiation research for materials science; metallurgical processing; mechanical properties and wear; chemical metallurgy; structural chemistry for ceramic processing and durability; structural methods for processing; manufacture and durability; glass and optical materials; reactor operation and services; neutron scattering characterization of materials for advanced technology advanced neutron methods; neutron diffraction and radiographic methods for materials utility and durability; and advanced neutron methods. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N82-27409# National Timber Research Inst., Pretoria (South Africa).
PROTECTION OF WOOD SURFACES WITH METALLIC OXIDES
H. Kubel and A. Pizzi Sep. 1980 24 p refs
(CSIR-SR-HOUT-210; ISBN-7988-2092-6) Avail: NTIS HC A02/MF A01

Zinc oxide as well as lead (II), lead (IV) and tin (II) oxide react with quaiacol as a simple lignin model compound to form complexes. In comparison with results obtained with chromium trioxide, only zinc oxide gives worthwhile results when used to waterproof wood. Because of the (dimeric) character of the complex formed with lignin, zinc oxide is a less efficient wood waterproofer than CrO_3, which instead forms (polymeric) complexes. A theory of the preservation effect of wood by metallic ion is advanced. Metallic compounds which are capable of further crosslinking the lignin network by forming insoluble complexes with it can act as wood waterproofers. S.L.

N82-27410*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ADVANCES IN MOIRE INTERFEROMETRY FOR THERMAL RESPONSE OF COMPOSITES Interim Report
Ernest W. Brooks, Jr., Carl T. Herakovich, Daniel Post, and Michael W. Hyer Mar. 1982 75 p refs
(Contract NCC1-15)
(NASA-CR-169121; NAS 1.26:169121; VPI-E-82-4; IR-27) Avail: NTIS HC A04/MF A01 CSCL 11D

An experimental technique for the precise measurement of the thermal response of both sides of a laminated composite coupon specimen uses Moire interferometry with fringe multiplication which yields a sensitivity of 833 nm (32.8 micro in.) per fringe. The reference gratings used are virtual gratings and are formed by partially mirrorized glass prisms in close proximity to the specimen. Results are compared with both results obtained from tests which used Moire interferometry on one side of composite laminates, and with those predicted by classical lamination theory. The technique is shown to be capable of producing the sensitivity and accuracy necessary to measure a wide range of thermal responses and to detect small side to side variations in the measured response. Tests were conducted

on four laminate configurations of T300/5208 graphite epoxy over a temperature range of 297 K (75 F) to 422 K (300 F). The technique presented allows for the generation of reference gratings for temperature regimes well outside that used in these tests. A.R.H.

N82-27411# Lockheed Missiles and Space Co., Palo Alto, Calif.
PANEL OPTIMIZATION WITH INTEGRATED SOFTWARE (POIS), VOLUME 2. USER INSTRUCTIONS: ECHO AND RRSYS Final Report, Jun. 1976 - Oct. 1980
P. Stern, B. O. Almroth, and P. Stehlin Wright-Patterson AFB, Ohio AFWAL Mar. 1981 135 p refs
(Contract F33615-76-C-3105; AF Proj. 2307)
(AD-A112224; AFWAL-TR-81-3073-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 01/3

Optimization of structural panels with respect to bifurcation buckling constraints tends to lead to imperfection sensitive panels. The panels may not represent least weight configurations if the influence of always present geometrical imperfections are taken into account. A software package, POIS (Panel Optimization with Integrated Software) was developed in response to this problem. Here user instructions are presented for Computer Program ECHO and RRSYS which are part of the POIS system. ECHO is a collection of computer programs for least weight design of stiffened structural panels subjected to multiple combinations of inplane loads. ECHO includes program modules for optimization of perfect panels and nonlinear static stress analysis of panels with random imperfections. The optimization problem is carried out as a constrained function minimization problem in which buckling loads, stress, and strain may be constraints. RRSYS is a program system for the nonlinear analysis of elastic structures by means of the Rayleigh-Ritz method. RRSYS is designed to analyze such diverse structural phenomena as collapse, linear and nonlinear bifurcation, vibrations and transient dynamic response. Author (GRA)

N82-27412# Lockheed Missiles and Space Co., Palo Alto, Calif.
DESIGN OF COMPOSITE MATERIAL STRUCTURES FOR BUCKLING: AN EVALUATION OF THE STATE-OF-THE-ART Final Report, Jun. 1976 - Oct. 1980
B. O. Almroth Wright-Patterson AFB, Ohio AFWAL Mar. 1981 70 p refs
(Contract F33615-76-C-3105; AF Proj. 2307)
(AD-A112218; LMSC-D681425; AFWAL-TR-81-3102) Avail: NTIS HC A04/MF A01 CSCL 11/4

Composite materials have favorable stiffness/weight and strength/weight ratios. Since the technology is relatively new and use of such materials introduces special problems, there has been some reluctance among designers to adopt composites in primary structures, particularly for buckling critical components. The purpose of the review of the literature presented in this report is to illustrate the special problems connected with use of composites. The body of the report summarizes the conclusions the author felt could be based on the available material. The Appendix contains an annotated bibliography, listing 95 references on the subject. Author (GRA)

N82-27413# General Dynamics Corp., Fort Worth, Tex.
A COMPARISON OF THE DELAMINATION AND ENVIRONMENTAL RESISTANCE OF A GRAPHITE-EPOXY AND A GRAPHITE-BISMALEIMIDE Final Report, 1 Oct. 1980 - 1 Aug. 1981
Dick J. Wilkins 15 Sep. 1981 215 p refs
(Contract N00019-80-C-0415)
(AD-A112474; NAV-GD-0037) Avail: NTIS HC A10/MF A01 CSCL 11/4

The objectives of this program were to compare the delamination and environmental resistance of a graphite-epoxy system (AS1/3501-6) and a graphite-bismaleimide system (T300-6K/V378A). An experimental program was conducted to determine critical values of strain-energy release rate for Mode I (peel) and Mode II (forward shear) delamination. Static delamination fracture and constant amplitude fatigue delamination growth rate data were obtained from dry specimens at -65 F, 75 F, 300 F, and 350 F, and on moisture-conditioned specimens at -65 F and 75 F. GRA

N82-27414# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
TRANSIENT RESPONSE OF LAMINATED, BIMODULAR-MATERIAL, COMPOSITE RECTANGULAR PLATES Interim Report
J. N. Reddy Oct. 1981 25 p refs
(Contract N00014-78-C-0647; NR Proj. 064-609)
(AD-A113851; VPI-E-81-28; TR-24) Avail: NTIS HC A02/MF A01 CSCL 11/7

Finite-element and closed-form solutions to the equations of motion governing layered composite plates of bimodular materials are presented for rectangular plates with all edges simply supported without in-plane restraint and tangential rotation and subjected to suddenly applied, sinusoidally distributed, transverse loadings. Finite element results are also presented for the same problem but with uniformly distributed step loading. The finite element results are found to be in good agreement with the closed-form solutions. Author (GRA)

N82-27415# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
GEOMETRICALLY NONLINEAR TRANSIENT ANALYSIS OF LAMINATED COMPOSITE PLATES Interim Report
J. N. Reddy Mar. 1982 37 p refs
(Grant AF-AFOSR-0142-81)
(AD-A113852; VPI-E-82-8; AFOSR-81-3TR) Avail: NTIS HC A03/MF A01 CSCL 11/7

Forced motions of laminated composite plates are investigated using a finite element that accounts for the transverse shear strains, rotary inertia, and large rotations (in the von Karman sense). The present results when specialized for isotropic plates are found to be in good agreement with those available in the literature. Numerical results of the nonlinear analysis are presented showing the effects of plate thickness, lamination scheme, boundary conditions, and loading on the deflections and stresses. The new results for composite places should serve as bench marks for future investigations. GRA

N82-27416# Dayton Univ., Ohio. Research Inst.
DEVELOPMENT OF ENGINEERING DATA ON ADVANCED COMPOSITE MATERIALS Final Contract Report, 1 Sep. 1978 - 30 Sep. 1981
D. Robert Askins Wright-Patterson AFB, Ohio AFWAL Feb. 1982 596 p refs
(Contract F33615-78-C-5172; AF Proj. 2419)
(AD-A113844; UDR-TR-81-85; AFWAL-TR-81-4172) Avail: NTIS HC A25/MF A01 CSCL 11/4

Engineering data have been generated on six advanced composite materials; T300/AFR800 (graphite/epoxy); SiC/5506 (silicon carbide/epoxy; HyE 2034D (pitch based graphite/epoxy); T300/V378A (graphite/polyimide); HyE 1076J (graphite/epoxy); and 6535-1 (graphite/epoxy). Prepreg tape was obtained from each vendor and laminates and test specimens prepared. Five different static mechanical properties (tension, compression, flexure, inplane shear, and interlaminar shear) were measured on various fiber orientations at four different temperatures (-67F, 72F, and two elevated temperatures). Tensile fatigue, creep, and stress-rupture tests were also conducted and four thermophysical properties (thermal expansion, thermal conductivity, specific heat, and glass transition temperature) were determined. Environmental agings (at 160F and 100 percent relative humidity) were conducted on each material and the effects on this exposure on several mechanical properties were determined. On four of the materials, tests were conducted on specimens with a hole located in the center of the gage section. On the last material, three different ply stacking sequences incorporating 0, 90, and + or - 45 deg. piles were tested. These three different sequences gave rise to tensile, compressive, and zero stress in the thickness direction at the specimen free edges. GRA

N82-27417# Dayton Univ., Ohio. Research Inst.
IMPROVED MATERIALS FOR COMPOSITES AND ADHESIVES Final Report, 16 May 1980 - 31 Aug. 1981
D. Askins, A. Behme, A. Biermann, W. Click, C. Fowler, J. T. Grant, T. Grossman, D. Hall, J. Hartness, and G. Jones Wright-Patterson AFB, Ohio AFWAL Dec. 1981 318 p refs
(Contract F33615-78-C-5102; AF Proj. 2319)
(AD-A114069; UDR-TR-81-108; AFWAL-TR-81-4154) Avail:

NTIS HC A14/MF A01 CSCL 11/4

This report presents a summary of the work performed by the University of Dayton Research Institute under Contract No. F33615-78-C-5102 during the period of 16 May 1980 through 31 August 1981. Research was conducted in the following areas: Structural Composites, Surface Energetics, Adhesives, Durability/Life Prediction of Composites and Adhesives, Traveling Wave Tubes, and Surface Analysis. The work was performed at the Air Force Wright Aeronautical Laboratories, Materials Laboratory, Wright-Patterson Air Force Base, Ohio, with Dr. J. M. Whitney as project engineer. Author (GRA)

N82-27418# Drexel Univ., Philadelphia, Pa. Ultrasonics Research Lab.

APPLICATION OF ULTRASONIC F-SCAN TO THE INSPECTION OF COMPOSITE MATERIALS Final Report

Joseph L. Rose, J. Bruce Nestleroth, and Shehab Negahban Lakehurst, N.J. Naval Air Engineering Center 15 Apr. 1982 45 p refs

(Contract N68335-80-C-1119; F41461000)

(AD-A114072; NAEC-92-159) Avail: NTIS HC A03/MF A01 CSCL 11/4

Composites are now being used in high strength, low weight applications such as the aircraft industry. Difficulties arise in the nondestructive testing and evaluation of these materials because of their fibrous nature. The traditional ultrasonic C-scan technique is often found very limiting. A new technique called F-scanning (Feature scanning) was developed that examines many features (characteristics) of the ultrasonic wave form such as amplitude ratios and frequency shifts. These features can be better used to locate defects. This technique was used to evaluate a composite patch that had severe void content. Photomicrographs were used to determine defective and nondefect areas for correlation with results obtained in the F-map process. These results showed an overall index of performance of 87.5 percent correct decisions. Author

N82-27419# California Univ., Livermore. Lawrence Livermore Lab.

STATISTICAL METHODOLOGY TO EVALUATE STRENGTH RELIABILITY OF COMPOSITE MATERIALS Final Report, 1 Jul. 1980 - 30 Jun. 1981

R. E. Barlow 12 Oct. 1981 12 p

(Contract W-7405-eng-48)

(DE82-003157; UCRL-15402) Avail: NTIS HC A02/MF A01

Composite material specimens are life tested at constant stress. At predetermined and also random times, subsamples are tested for residual strength. Also at random times, ruptures may occur. The objective is to evaluate residual strength as a function of time, based on test histories. The optimum strength sampling strategies are determined in order to gain the most information from test histories. DOE

N82-27396*# Massachusetts Inst. of Tech., Cambridge.

EFFECT OF PROCESSING ON POLYMER/COMPOSITE STRUCTURE AND PROPERTIES

In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 185-197 refs (For primary document see N82-27382 18-23)

Avail: NTIS HC A13/MF A01 CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N82-27420*# National Aeronautics and Space Administration, Washington, D. C.

NICKEL HYDROXIDE ELECTRODE. 3: THERMOGRAVIMETRIC INVESTIGATIONS OF NICKEL (II) HYDROXIDES

W. Dennstedt and W. Loeser Jan. 1982 13 p refs Transl. into ENGLISH from Electrochim. Acta (Northern Ireland), 1971, v. 16, no. 3 p 429-435 Transl. into Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3542)

(NASA-TM-76666; NAS 1.15:76666) Avail. NTIS HC A02/MF A01 CSCL 07D

Water contained in Ni hydroxide influences its electrochemical reactivity. The water content of alpha and beta Ni hydroxides is different with respect to the amount and bond strength. Thermogravimetric experiments show that the water of the beta Ni hydroxides exceeding the stoichiometric composition is completely removed at ,60 deg. The water contained in the interlayers of the beta hydroxide, however, is removed only at higher temperatures, together with the water originating from the decomposition of the hydroxide. These differences are attributed to the formation of II bonds within the interlayers and between interlayers and adjacent main layers. An attempt is made to explain the relations between water content and the oxidizability of the Ni hydroxides. S.L.

N82-27421*# National Aeronautics and Space Administration, Washington, D. C.

CONTRIBUTION TO THE KNOWLEDGE OF NICKEL HYDROXIDE ELECTRODES. 5. ANALYSIS AND ELECTROCHEMICAL BEHAVIOR OF CADMIUM NICKEL HYDROXIDES

H. Bode and W. Dennstedt Dec. 1981 17 p refs Transl. into ENGLISH from Electrochim. Acta, v. 17, 1972 p 106-118 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by VARTA, Research and Development Center, Kelkheim/Ts, West Germany

(Contract NASw-3542)

(NASA-TM-76716; NAS 1.15:76716) Avail: NTIS HC A02/MF A01 CSCL 07D

Electrochemical experiments performed at sintered and bulk electrodes show that beta nickel hydroxide contains an electrochemically inactive proportion of cadmium hydroxide of up to 10%. The electrochemically ineffective cadmium hydroxide is homogeneously dissolved in beta nickel hydroxide. S.L.

N82-27422# Air Force Academy, Colo. Physical Chemistry and Electrochemistry Div.

SELECTION OF CATIONS FOR AMBIENT TEMPERATURE CHLOROALUMINATE MOLTEN SALTS USING MNDO MOLECULAR ORBITAL CALCULATIONS Interim Technical Report, Jan. 1981 - Jan. 1982

John S. Wilkes and Charles L. Hussey Jan. 1982 21 p refs (AF Proj. 2303)

(AD-A111651; FJSRL-TR-82-0002) Avail: NTIS HC A02/MF A01 CSCL 07/4

Mixtures of aluminum chloride and some organic chloride salts form new salts that are liquid at room temperature. The properties of the organic salt often have a large effect on the physical and electrochemical properties of the melts. A method is described for predicting the reduction potentials for a variety of organic cations that might be candidates to form low melting mixtures with aluminum chloride. The method involves calculation of lowest unoccupied molecular orbital energies for cations and estimations of half-wave reduction potentials. Comparisons of predicted and measured potentials are made. GRA

N82-27423# Dayton Univ., Ohio.

THE 3RD SYMPOSIUM ON APPLIED SURFACE ANALYSIS Final Technical Report

John T. Grant Mar. 1982 74 p Symp. held at Dayton, 3-5 Jun. 1981

(Grant AF-AFOSR-0159-81; AF Proj. 2303)

(AD-A112364; AFOSR-82-0188TR) Avail: NTIS HC A04/MF A01 CSCL 07/4

The 3rd Symposium on Applied Surface Analysis was held at the University of Dayton, 3-5 June 1981. This Symposium was held to meet a need, namely to show the transition between basic surface science research and applications of this research in areas of Air Force interest. Areas receiving special attention at this Symposium were adhesion, coatings, corrosion, catalysis, thin films, and electronic materials. GRA

N82-27424# Georgia Inst. of Tech., Atlanta. School of Physics.

THE DRIFT, DIFFUSION, AND REACTIONS OF SLOW IONS IN GASES: O. N. R. SUMMARY QUESTIONNAIRE Progress Report, 1 Nov. 1980 - 31 Oct. 1981

E. W. McDaniel and I. R. Gatland 1 Nov. 1981 7 p refs
(Contract N00014-80-C-0243; NR Proj. 014-314)
(AD-A107129) Avail: NTIS HC A02/MF A01 CSCL 07/4

The program of research on ionic transport in gases is described. Experimental measurements of ionic mobilities and diffusion coefficients are discussed. The use of the mobility data to obtain ion-neutral interaction potentials is described. References to recent publications are given, and the program for the next year is outlined. GRA

N82-27425# Harvard Coll. Observatory, Cambridge, Mass.

THEORETICAL STUDIES OF METAL OXIDES Final Report, 30 Sep. 1978 - 31 Oct. 1981

Alex Delgarno Oct. 1981 15 p refs
(Grant AF-AFOSR-3677-78; AF Proj. 2303)
(AD-A112402; AFOSR-82-0159TR) Avail: NTIS HC A02/MF A01 CSCL 07/2

Detailed calculations are carried out of the potential energy curves of the low-lying singlet and triplet states of MgO and the electric dipole transition moments between the states are obtained. Using the results, a comprehensive analysis of spectral line data is possible and the mechanisms by which MgO is dissociated by photons can be identified. Preliminary estimates suggest a radiative lifetime of 2.1 x 10 of the minus 8th seconds for the B 1Sigma(+) state and of 2.8 x 10 to the minus 4th seconds for the A 1PI state. Some calculations on MgO(+) have been carried out. We predict an ionization potential for MgO of 7.9 eV. GRA

N82-27426# Northeastern Univ., Boston, Mass. Dept. of Chemistry.

RESEARCH ON NEW SOLID SUPERIONIC CONDUCTORS CONTAINING Cu +, Ga +, In +, AND Tl + Final Report

D. F. Shriver and D. H. Whitmore Feb. 1982 8 p refs
(Grant AF-AFOSR-3227-77; AF Proj. 2303)
(AD-A112478; AFOSR-82-0187TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

An investigation was made on a series of solid electrolytes of the formula A2MX4 (A(+) = Cu(+), Ag(+) In(+), or T1(+); M2(+) = Zn2(+), Cd2(+), or Hg; X = Br(-) or I(-)). Electrical measurements on these materials show consistently lower conductivity for the d(10)s(2) ions, In(+) and Tl(+), than for the d(10) ions, Cu+ and Ag+. A single crystal X-ray investigation of the structure for T12ZnI4 demonstrates that the cation resides in a low symmetry 5-coordinate environment. Raman spectroscopy and X-ray powder diffraction suggest a similar structure for the corresponding In(+) salt. By contrast, structural data in the literature indicate that Cu(+) and Ag(+) reside in tetrahedral sites in their respective compounds. These comparisons suggest that the lower conductivity of the D(10)s(2) ions arise from the structural differences. Ab initio Hartree-Fock LCAO-MO calculations were performed on MI4 arrays. The ground state structure was taken as the cation residing in the center of a tetrahedral I4 array and the transition state was modeled by the ion in the face of the I4 array. Lower energies were found for the movement of the d(10) ions into the face of the iodide tetrahedron. The results demonstrated that the detailed electronic structure of the cation can have a profound influence on ion transport. The polymer electrolyte systems studied have the approximate composition MX-4PEO(M-alkali metal ion, X-large anion, and PEO is repeat unit of polyethylene oxide). They show promise for solid state electrochemical devices. GRA

N82-27427# Pennsylvania State Univ., University Park. Applied Research Lab.

EXPERIMENTAL EVALUATION OF A CARBON SLURRY DROPLET COMBUSTION MODEL Ph.D. Thesis

Gerald A. Szekely, Jr. Naval Sea Systems Command 14 Dec. 1981 287 p refs Sponsored in part by AiResearch Mfg. Co.
(Contracts N00024-79-C-6043; F33615-77-C-2004; F33615-81-K-2039)
(AD-A112379; ARL/PSU/TM-81-253) Avail: NTIS HC A09/MF A01 CSCL 21/2

A theoretical and experimental investigation of the combustion process of carbon slurry fuels is described. The combustion of individual drops (400-1000 micrometer in diameter) supported at various positions within an open turbulent diffusion flame was observed. When a slurry drop was exposed to the flame, the liquid fuel evaporated in the first stage of the process leaving a porous carbon agglomerate formed from the carbon particles in the slurry. The second stage involved heatup and reaction or quenching of the agglomerate. GRA

N82-27428# California Univ., Irvine. Dept. of Chemistry.

CHEMISORPTION AND THERMAL CHEMISTRY OF AZULENE NAPHTHALENE ADSORBED ON PT 3 Interim Report

David Dahlgren and John C. Hemminger 1 Oct. 1981 35 p refs
(Contract N00014-79-C-0648)
(AD-A107068; TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/4

The ordering phenomena and thermal chemistry of the isomeric aromatic hydrocarbons azulene and naphthalene have been studied on a Pt(III) surface. Complete dehydrogenation with an onset of about 200 C is the eventual fate of these molecules absorbed on Pt(III). Several ordered phases exist for azulene overlayers as a function of coverage. Azulene overlayers with C/Pt atom ratios in the range 1-1.3 exhibit a reversible transition with temperature. The orientational ordering of neighboring molecules appears to be governed by intermolecular forces rather than the molecule-Pt interaction in both azulene and naphthalene overlayers. Author (GRA)

N82-27429# California Univ., Irvine. Dept. of Chemistry.

THE NATURE OF THE PHASE TRANSITION OBSERVED FOR MONOLAYERS OF AZULENE ON PT 3 Interim Report

David Dahlgren and John C. Hemminger 1 Oct. 1981 16 p refs
(Contract N00014-79-C-0648)
(AD-A107067; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

A model is presented for the reversible phase transition observed for azulene monolayers on Pt(III). Below the transition temperature the overlayer LEED pattern consists of (3x3) aligned with the substrate and (3x3) rotated by 30 degrees. Above the transition temperature the LEED pattern is a (3x3) aligned with the substrate. The model attributes the phase transition to an order-disorder transition of the rotational orientation of azulene molecules with the molecular plane parallel to the surface.
Author (GRA)

N82-27430# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

THE USE OF THE ELECTROCHEMICAL PERMEATION TECHNIQUE TO STUDY HYDROGEN TRANSPORT AND TRAPPING IN IRON

I. M. Bernstein and Anthony W. Thompson Feb. 1982 18 p refs Sponsored in part by AF and NSF
(Contract N00014-75-C-0265)
(AD-A112488; TR-15) Avail: NTIS HC A02/MF A01 CSCL 07/4

The electrochemical technique has become an important tool in studying hydrogen transport in metals. In order to maximize the information obtainable, the electrochemical conditions must be carefully controlled, particularly at the input and output surfaces. Subsequent analysis of the kinetics of consecutive transients can then be used to discriminate between strong (irreversible) and weak (reversible) traps. This approach has been illustrated for iron and a number of iron-titanium alloys, and it has been shown to be possible to model the data to calculate most of the important trapping parameters in such systems. These parameters describe trap populations that can be manipulated to control the extent of some types of hydrogen embrittlement, as illustrated by experiments on a titanium-containing HSLA steel. The permeation technique has also shown to be useful in detecting the occurrence and extent of dislocation transport of hydrogen in iron. Some of the implications of the effect of such a process on subsequent embrittlement in ferrous and non-ferrous alloys have been assessed. GRA

N82-27431# Wisconsin Univ., Madison. Dept. of Mechanical Engineering.

IN-CYLINDER SAMPLING OF HYDROCARBONS IN A TEXACO L-141 TCP ENGINE Final Report, 1978 - 1981

Michael C. Ingham, P. S. Myers, and O. A. Uyehara 20 Feb. 1982 8 p refs

(Grant DAAG29-78-G-0047)

(AD-A112473; ARO-15403.3-E) Avail: NTIS HC A02/MF A01 CSCL 21/5

A technique was developed to obtain time and spatially resolved gas samples from the development volume of a reciprocating engine. The technique was used to investigate the distribution of fuel and products of combustion, with emphasis on the sources and formation mechanisms of gaseous hydrocarbons, in a single cylinder -141 TCP engine. A mathematical model predicted the actual sample gas origin, relative to the instantaneous sampling orifice position, as a function of the local gas motion and properties. Samples were taken at times ranging from 30 deg CA BTDC to 60 deg CA ATDC. Gas chromatography gave the sample composition, including the concentration versus carbon number distribution of the hydrocarbons. Local stoichiometry, local reactant hydrogen/carbon ratio and apparent local particulate concentration were also calculated. Significant vertical stratification persists in the L-141 TCP combustion chamber as late as 60 deg CA ATDC, indicating that mixing in the vertical direction in the central part of the chamber is inhibited by solid body rotation of the gases. Exhaust hydrocarbons consisted primarily of heptane, probably originating from the bowl surface, and species having two carbon atoms. Total hydrocarbons and the relative proportion of heptane to C2 species decreased with increasing load, because of the higher gas temperatures.

Author (GRA)

N82-27432# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va.

DETERMINATION OF SODIUM GLUCONATE IN CORROSION-REMOVING COMPOUNDS Technical Report, Apr. 1980 - Apr. 1981

Troy Nichols and Laurie Mihalaki Aug. 1981 17 p refs

(AD-A107244; MERADCOM-2333) Avail: NTIS HC A02/MF A01 CSCL 07/4

A method is presented for the determination of sodium gluconate in the Type I MIL-C-14460B corrosion-removing compound. The procedure consists of the extraction of sodium gluconate as gluconic acid, silylation, and quantitation by gas-liquid chromatography. Qualitative confirmation of sodium gluconate is made through the retention time of the silyl derivative on the chromatographic column. Author (GRA)

N82-27433# Battelle Columbus Labs., Ohio.

STUDY OF THE TWOPHOTON PHOTOREFRACTIVE EFFECT IN LITHIUM NIOBATE Final Report, 15 Jun. 1978 - 1 Sep. 1981

Van E. Wood, Carl M. Verber, Rand C. Sherman, and Nile F. Hartman 26 Oct. 1981 7 p refs

(Contract DAAG29-78-C-0028)

(AD-A107493; ARO-15246.3-P) Avail: NTIS HC A02/MF A01 CSCL 07/5

The dynamics and wavelength dependence of recording and optical erasure of thick phase gratings produced photorefractively were studied in undoped and in iron-doped lithium niobate. Properties of gratings formed at high incident power densities via two-photon absorption were compared with those of gratings formed at shorter wavelengths by the usual one-photon mechanism. Gratings formed by the two-photon mechanism in undoped crystals exhibit a distinctive two-exponential time dependence of optical erasure not observed in other circumstances. This shows that the nature of final trap states, as well as absorption and charge transfer characteristics, is important in controlling photorefractive sensitivity. A method was discovered for producing high diffraction efficiency gratings at infrared frequencies in titanium-diffused optical waveguides on lithium niobate.

Author (GRA)

N82-27434# Exxon Research and Engineering Co., Linden, N.J. Corporate Research-Technology Feasibility Center.

RADIATION/CATALYTIC AUGMENTED COMBUSTION Final Report, 1 Jun. 1977 - 28 Feb. 1981

Moshe Lavid Jul. 1981 40 p refs

(Contract F49620-77-C-0085; AF Proj. 2308)

(AD-A112376; AFOSR-82-0132TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

Two techniques for extending aircraft operational range are reported. They are radiative and catalytic augmentation techniques to enhance combustion initiation and reaction kinetics which restrict combustor operation via limits on flammability, flame propagation, ignition and stability. Both techniques demonstrated the capability to enhance combustion processes and to broaden normally encountered stability limits. The radiative technique under laboratory static conditions successfully ignited fuel air mixtures, and enhanced combustion processes, utilizing pulsed and continuous VUV light souces. Similarly, the catalytic technique provided efficient combustion under normally difficult fuel lean, low temperature, conditions. A complementary effort involves the development of analytical capability required for modeling the radiative and catalytic techniques. Radiative ignition and combustion enhancement tests were performed on gaseous mixtures under various static conditions. Successful radiative ignitions were obtained with pulsed and continuous VUV/UV light sources. GRA

N82-27435# United Technologies Research Center, East Hartford, Conn. Applied Physics Lab.

INVESTIGATION OF COMBUSTION PROCESS USING FIBER OPTICS Final Technical Report, 14 May 1980 - 14 May 1981

William W. Morey 14 Jun. 1981 85 p refs

(Contract N00019-80-C-0331)

(AD-A107029; UTRC/R81-925172-4) Avail: NTIS HC A05/MF A01 CSCL 21/2

This technical report describes the results of a 12-month program to design, build, and test a fiber optic viewing device (fiberscope) on a high pressure gas turbine combustor rig. High speed motion picture photography along with video tapings were made of the combustor flame with the fiberscope. With the high speed photography the turbulent flame motion could be followed in some detail. Visible wavelength spectra were taken of the flame emission through the fiberscope and analysis indicates that a mean flame temperature can be measured. The fluctuation frequency spectrum of the flame was also observed with a fast fourier transform analyzer, and the possibility of coupling with acoustic resonances was indicated. In addition, the fuel spray was illuminated with laser light from the fiberscope probe and contour plots were made of a sequence of frames from the movie film. The combustor viewing probe may be used as an important aid in future combustion design and to help determine causes of various failure modes of combustor liners.

Author (GRA)

N82-27436# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

MODELING SOLID-FUEL RAMJET COMBUSTION INCLUDING RADIATION HEAT TRANSFER TO THE FUEL SURFACE Interim Report

Michael E. Metochianakis (Greek Air Force), William V. Goodwin, Uri Katz, and David W. Netzer Aug. 1981 50 p refs

(AD-A107441; NPS67-81-012) Avail: NTIS HC A03/MF A01 CSCL 21/5

Radiation heat transfer from soot in the flame zone to the fuel surface of a solid fuel ramjet was incorporated into an existing two-dimensional computer code. Improved prediction of the fuel regression pattern was obtained. Near-wall temperature measurements indicated that the model predicts too much turbulent mixing near the fuel surface. Author (GRA)

N82-27437# Naval Research Lab., Washington, D. C.

METAL OXIDE SOLUBILITY AND MOLTEN SALT CORROSION Interim Report

K. H. Stern 29 Mar. 1982 27 p refs

(AD-A112642; NRL-MR-4772) Avail: NTIS HC A03/MF A01 CSCL 07/2

Recent studies of the solubility reactions of the oxides of Al, Cr, Ni, Co, Y, and Mn are reviewed. The oxides of each of these metals dissolve by distinctly different reactions in the acid and basic regimes. For each of the oxides, the solubility is a minimum between the two regimes. Therefore the solution of a

protective oxide is highly dependent on the melt acidity. For Na2SO4, the acidity is controlled by the composition (SO2 and SO3) of the gas phase. GRA

N82-27438# Utah State Univ., Logan. Electro-Dynamics Lab.

ABSORPTION MEASUREMENTS OF CO2 AND H2O AT HIGH RESOLUTION AND ELEVATED TEMPERATURES

Mark P. Esplin, Ronald J. Huppi, Hajime Sakai, George A. Vanasse, and Laurence S. Rothman Feb. 1982 94 p refs
(Contract F19628-81-C-0113; AF Proj. 2310)
(AD-A113824; EDL-SRL-82-1; AFGL-TR-82-0057; SR-1) Avail: NTIS HC A05/MF A01 CSCL 07/4

High resolution (0.007 cm-1) high temperature (to 800K) measurements on H2O and several isotopes of CO2 using the AFGL high resolution cat's eye interferometer are presented. The instrumentation used is briefly described and resulting line positions used to obtain spectroscopic constants are tabulated. A general description of the technique used for identifying transition frequencies is given as well as its specific application to H2O and CO2 molecules. Comparisons of calculations of line positions using spectroscopic constants obtained from high temperature data with those obtained at room temperature are presented. A global fit approach to the CO2 data is also discussed, incorporating high resolution measurements throughout the infrared to achieve a self-consistent set of spectroscopic constants. GRA

N82-27439# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Laser and Optical Materials Branch.

ADDITIONAL P(3/2) AND P(1/2) INFRARED EXCITED STATE LINES OF GALLIUM AND INDIUM IN SILICON Interim Technical Report, Jun. 1979 - Sep. 1981

John J. Rome, Robert J. Spry, Thomas C. Chandler, Gail J. Brown, B. C. Covington (Sam Houston State Univ.), and Richard J. Harris (Dayton Univ.) Feb. 1982 23 p refs
(AF Proj. 2306)
(AD-A113645; AFWAL-TR-81-4149) Avail: NTIS HC A02/MF A01 CSCL 07/4

Infrared excitation spectra were measured for the p3/2 lines of gallium in silicon. Two missing lines were observed, and a previous weak or doubtful one was confirmed. Spectra were also obtained of the p1/2 lines of gallium and indium in silicon, demonstrating for the first time the 4p' line for both dopants. Complete correspondence now exists between all observed excited state lines of gallium and indium in silicon and the lines of boron and aluminum, and with those predicted by theory. From the new spectral data, the spin-orbit splitting of the valence bands is calculated to be 42.62 + or - 0.04 meV.Author (GRA)

N82-27440# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Fuels Branch.

RELATIVE RETENTION TIME LIBRARY FOR SELECTED HYDROCARBONS VIA GLASS CAPILLARY GAS CHROMATOGRAPHY Final Report, Jun. - Aug. 1978

Paul C. Hayes, Jr. Feb. 1982 38 p refs
(AF Proj. 3048)
(AD-A114019; AFWAL-TR-81-2140) Avail: NTIS HC A03/MF A01 CSCL 07/4

This technical report describes an experimental study of the reliability of a glass capillary gas chromatographic system to assign tentative peak identity according to relative retention times under carefully controlled operating conditions. The first phase of the effort involved the set-up, calibration, and optimization of the capillary system. Optimization was realized with the maximum resolution between selected pairs of hydrocarbons in a minimum of sample analysis time. Peak resolution was investigated as a function of carrier capillary pressure and temperature programming rate. A reference hydrocarbon was chosen. The repeatability of relative retention times was determined for: normal alkanes, branched alkanes, olefins, alkyl benzenes, alkylated napthalenes, saturated cyclic alkanes, and alkyl anilines that could be present in JP-4. Author (GRA)

N82-27441# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.

A COMPUTER CODE FOR THE SOLUTION OF THE EQUATIONS GOVERNING A LAMINAR, PREMIXED, ONE-DIMENSIONAL FLAME

Terence P. Coffee Apr. 1982 143 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A114041; AD-F300031; ARBRL-MR-03165) Avail: NTIS HC A07/MF A01 CSCL 21/2

A computer program for numerically solving the equations governing a laminar, premixed, one-dimensional flame is described. Both unbounded flames and burner stabilized flames are discussed. Some numerical considerations in successfully using the code are presented. GRA

N82-27442# EIC, Inc., Newton, Mass.

THE USE OF THE REACTIVE ETHER TETRAHYDROFURAN (THF) IN RECHARGEABLE LITHIUM CELLS

K. M. Abraham and J. L. Goldman Apr. 1982 22 p refs Presented at the Intern. Meeting on Lithium Batteries, Rome, 27-29 Apr. 1982 Submitted for publication
(Contract N00014-77-C-0155; NR Proj. 359-638)
(AD-A113604; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

The usefulness of tetrahydrofuran (THF) as a cosolvent with 2-methyltetrahydrofuran (2Me-THF)/LiAsF6 for improving the low temperature rate capability of rechargeable Li cells has been explored. Li/TiS2 cells utilizing 2Me-THF/LiAsF6 blended with 15-50 volume-percent THF have shown substantially improved rate characteristics at 0 and -10C. In addition, the Li electrode in such cells has exhibited practically useful cycling efficiencies. Author (GRA)

N82-27443# EIC, Inc., Newton, Mass.

CHARACTERIZATION OF ETHER ELECTROLYTES FOR RECHARGEABLE LITHIUM CELLS

K. M. Abraham, J. L. Goldman, and D. L. Natwig Mar. 1982 34 p refs Submitted for publication
(Contract N00014-77-C-0155; NR Proj. 359-638)
(AD-A113603; TR-5) Avail: NTIS HC A03/MF A01 CSCL 07/4

2Methyl-tetrahydrofuran (2Me-THF)/LiAsF6 and several diethyl ether (DEE)/LiAsF6-based electrolytes have been characterized for their usefulness in rechargeable Li/TiS2 cells. This characterization has involved extended room temperature cell cycling at various depths of discharge, evaluation of rate/capacity behavior of cells at 25C and -10C, and storage of cells at 50C for up to one month with subsequent cycling. The thermal stability of the electrolytes at 71C was evaluated by storage experiments in sealed-tubes, followed by product analysis. The performance of 2Me-THF/LiAsF6 cells far surpassed the others. The present data further substantiate previous reports from this laboratory of the superior behavior of 2Me-THF/LiAsF6 solutions in rechargeable Li cells. The DEE/LiAsF6 based electrolytes are too unstable thermally to be practically useful. Author (GRA)

N82-27444# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.

THEORETICAL MODELS FOR THE ELECTRONIC STRUCTURE OF HYDROGENATED AMORPHOUS SILICON 2: THREE-CENTER BONDS Interim Report

M. E. Eberhart, K. H. Johnson, and D. Adler 31 Mar. 1982 25 p refs
(Contract N00014-81-K-0499; NR Proj. 056-757)
(AD-A113561; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/4

SCF-X alpha-SW molecular-orbital calculations have been carried out for several configurations of hydrogenated silicon clusters in order to determine the contribution of three-center bonding to the electronic structure of hydrogenated amorphous silicon. Three-center bonding of the dissociated molecular hydrogen is shown to stabilize Si-Si bonds over a wide range of Si-Si distances. It can be concluded that hydrogenation can, in principle, saturate all strained as well as dangling bonds in a-Si. The results further indicate that a single hydrogen three-center bond is unlikely in a-Si:H alloys. GRA

N82-27445# Utah Univ., Salt Lake City. Dept. of Chemical Engineering.

NUMERICAL ESTIMATION IN COMBUSTION KINETICS

Final Report
R. C. Aiken 15 Feb. 1982 11 p ref
(Grant AF-AFOSR-0220-80; AF Proj. 2304)
(AD-A113025; AFOSR-82-0260TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

In this article we apply this most useful approximation in the solution of ordinary differential equations -- the steady state approximations -- to combustion applications, for the first time. The reasons this approximation has not worked in the past are detailed. Basically, they have not worked because of the very stiff nature of the system in which the stiff 'boundary layer' occurs internal to the solution time domain and significantly complicates the analysis. The saved time with implementing the steady approximation is indicated to be quite significant and has potential to allow numerical solution of real combustor models for which presently it is too time consuming to solve. Generalization is needed for kinetics equation sets of arbitrary size.
Author (GRA)

N82-27446# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
HARD SURFACE DETERGENCY. PART 1: INTERFACIAL TENSIONS OF CANDIDATE SURFACE DECONTAMINATING AGENTS IN CONTACT WITH MODEL FLUIDS Interim Report
R. C. Little and E. M. Fisher 23 Apr. 1982 30 p refs
(AD-A113972; NRL-MR-4802-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

The interfacial tension of aqueous solutions of surfactants were determined against three model fluids: o-dichlorobenzene, methyl salicylate and malathion. The effect of surfactant structure and model fluid on the adsorption process were catalogued with the aid of the Szyszkowski equation and the Girifalco-Good parameters for the specific solution-fluid pairs. Author (GRA)

N82-27447# Arizona Univ., Tucson. Dept. of Chemistry.
A COMPARISON OF DATA REDUCTION TECHNIQUES FOR LINE EXCITED OPTOACOUSTIC ANALYSIS OF MIXTURES Interim Report
Scott B. Tilden and M. Bonner Denton 5 Jan. 1982 24 p refs
(Contract N00014-75-C-0513; NR Proj. 051-549)
(AD-A113469; TR-28) Avail: NTIS HC A02/MF A01 CSCL 07/4

The use of discrete line laser excitation for the optoacoustic analysis of gas mixtures holds promise as a formidable analytical tool. However, this technique presents challenging demands on the data reduction process to increase the reliability of the analytical results. The problems unique to this method which made data reduction difficult are discussed. Use of simultaneous equations, multivariate least squares and a new iterative coefficient weighted least squares approach are compared. Data indicating the relative performance of these methods are presented.
Author (GRA)

N82-27448# Arizona Univ., Tucson. Dept. of Chemistry.
INVESTIGATIONS OF NEBULIZER TECHNIQUES FOR DIRECT DETERMINATION OF METALS IN LUBRICATING OILS BY ICP
J. D. Algeo, D. R. Heine, H. A. Phillips, and M. B. Denton 1 Feb. 1982 19 p refs
(Contract N00014-75-C-0513)
(AD-A113490; TR-27) Avail: NTIS HC A02/MF A01 CSCL 11/8

Equipment and procedures are described which allow the analysis of metals in lubricating oils w/o need for dilution or other sample pretreatment. A sample heater has been added to a modified Babington principle nebulizer. This nebulizer is capable of producing, from undiluted oils, aerosols suitable for introduction into an Inductively Coupled Plasma Atomic Emission Spectrophotometer. Heating the samples immediately prior to nebulization greatly increases the output of aerosol and reduces variations in output due to differences in sample viscosity. The type of organometallic complex used in the preparation of standards is shown to be unimportant if the region of the plasma which is observed is well chosen. Author (GRA)

N82-27449# Arizona Univ., Tucson. Dept. of Chemistry.
DETERMINATION OF NUCLEOTIDES BY LIQUID CHROMATOGRAPHY WITH A PHOSPHORUS SENSITIVE INDUCTIVELY COUPLED PLASMA DETECTOR Interim Report
D. R. Heine and M. Bonner Denton 14 Dec. 1981 29 p refs
(Contract N00014-75-C-0513; NR Proj. 051-549)
(AD-A113489; TR-26) Avail: NTIS HC A03/MF A01 CSCL 07/4

Quantitative analysis of 100 microliters nucleotide samples is accurately performed by analyzing total phosphorus concentration using an inductively coupled plasma (ICP) system. A single calibration using Na2HPO4 (aq) is useful for all nucleotides. A detection limit of 750 ng of phosphorus is determined with an RSD of 4.5%. High performance liquid chromatography (HPLC) is used to separate mixtures of nucleotides on an anion exchange column using acetate buffers. The ICP is used as a selective detector by observing P(I) emissions at 213.6 nm. A Babington nebulizer which is used to aspirate the high percentage salt solutions with 6% efficiency is described. Author (GRA)

N82-27450# Indiana Univ., Bloomington. Dept. of Chemistry.
MICRODROPLET SAMPLE APPLICATION IN ELECTROTHERMAL ATOMIZATION FOR ATOMIC ABSORPTION SPECTROMETRY Interim Report
J. G. Shabushnig and G. M. Hieftje 29 Mar. 1982 33 p refs
(Contract N00014-76-C-0838)
(AD-A112883; TR-44; TR-52) Avail: NTIS HC A03/MF A01 CSCL 07/4

The application of liquid samples in the form of microdroplets, approximately 150 microns in diameter, to an electrothermal atomizer has been evaluated. This technique has been found to offer improved precision (1-2% RSD), microsampling capabilities, and simplified calibration using a single concentration standard. Examination of dried sample after deposition indicates reduced spreading and crystal size for microdroplet and aerosol deposition compared with manual micropipetting methods. Crystal size and deposit spreading were found to correlate with the degree of suppression of Pb signals by Cl(-) and of Au signals by sulfate.
Author (GRA)

N82-27451# Gulf Research and Development Co., Pittsburgh, Pa.
INVESTIGATION OF MECHANISMS OF HYDROGEN TRANSFER IN COAL HYDROGENATION Quarterly Progress Report, Mar. - Jun. 1981
D. C. Cronauer Sep. 1981 52 p refs
(Contract DE-AC22-80PC-30080)
(DE82-004407; DOE/PC-30080/5) Avail: NTIS HC A04/MF A01

Model compound and coal liquefaction experiments were carried out in a stainless steel tubular reactor at 4500 C to observe the effects of hydrogen transfer on solvent isomerization. Significant observations are that: (1) methylindan production from tetrain in the presence of dibenzyl took place by at least two different mechanisms, only one of which involved the normal cracking dibenzyl; (2) deuterium hydrogen isotope studies with model compounds and coal liquefaction indicated that kinetic data from the model compound experiments should be applied to coal liquefaction only with caution; and (3) solvent isomerization by ring contraction is a problem in recycle operation due to the low hydrogen donor capability and exceptional stability of the rearranged product. DOE

N82-27452# Sassi Corp., Indianapolis, Ind.
PROCESS SELECTION AND INVESTMENT ANALYSIS, METHANATION FACILITY FOR PUROX PYROLYSIS SYSTEM OFF-GAS
Sep. 1981 173 p
(Contract DE-AC01-79CS-20449)
(DE82-004584; DOE/CS-20449/1) Avail: NTIS HC A08/MF A01

The Sassi Corporation of Indianapolis, Indiana, is investigating the commercial viability of converting refuse (trash and garbage) to synthetic natural gas. This conversion is accomplished by: (1) shredding and preparing the refuse for conversion; (2) producing a gas of low calorific value from the refuse using the Union Carbide Purox Process; and (3) methanating the

Purox off-gas to a quality suitable for sale in the existing gas distribution system. Based on the scheme envisioned, a process design has been prepared for a facility which processes 46.87 MMSCFD of Purox off-gas, resulting in 26.4 MMSCFD of SNG. A detailed process description, process flow diagram, and a detailed description of the mechanical aspects of the plant are included in this report. Investment analysis reveals that capital requirements for the facility are approximately $47,320,000, resulting in a payout, not including taxes or interest, of 8.3 years. DOE

N82-27453# Colorado School of Mines, Golden. Dept. of Chemical and Petroleum Refining Engineering.
MECHANISMS AND KINETICS OF COAL HYDROGENATION Quarterly Progress Report, Jul. - Sep. 1981
R. M. Baldwin Oct. 1981 52 p
(Contract DE-AC22-79ET-14881)
(DE82-004867; DOE/ET-14881/7) Avail: NTIS HC A04/MF A01

A coal hydrogenation research project is described. The rates of coal hydrogenation in continuous flow stirred tank and tube flow reactors using pure hydrogen, catalyzed CO-STEAM, and syngas processing conditions are compared. The influence of coal properties on the rate of hydrogenation of coal to preasphaltenes, asphaltenes, and oil in batch reactors is studied. The effect of operating conditions (temperature, added catalysts, and pressure) on the rate of hydrogenation of coal derived preasphaltenes and asphaltenes is studied. The effect of selected disposable catalysts on the rate of batch hydrogenation of selected bituminous coals is studied. Promising catalyst systems in the continuous processing units are tested. A unified kinetic/mechanistic model was formulated for coal liquefaction taking into account petrography of the feed coal and hydrocarbon lumps in the product oil. DOE

N82-27454# Pittsburg and Midway Coal Mining Co., Shawnee Mission, Kans.
RESEARCH ON SOLVENT REFINED COAL Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1981
Nov. 1981 67 p
(Contract DE-AC22-81PC-40005)
(DE82-004535; DOE/PC-40005/1) Avail: NTIS HC A04/MF A01

Pittsburgh seam coals from the Powhatan No. 3, Powhatan No. 6, McElroy, Robinson Run and a blend of coals from the Powhatan No. 6 and Ireland Mines were evaluated as feedstocks for major liquefaction facilities. Yields and operability with all of these coals were found to be generally satisfactory at normal SRC II operating conditions. In addition, a series of runs was conducted in the SRC II mode with Pittsburgh seam coal from the Powhatan No. 5 Mine at conditions expected to produce high oil yields. Oil yield was increased and SRC yield decreased significantly by increases in pressure, residence time and recycle solids levels over those normally used. T.M.

N82-27455# University of Western Kentucky, Bowling Green. Dept. of Chemistry.
NEW CATALYSTS FOR COAL LIQUID UPGRADING Quarterly Report, 1 Sep. - 30 Nov. 1981
Lawrence J. Boucher 1981 8 p
(Contract DE-FG22-81PC-40812)
(DE82-004402; DOE/PC-40812/T1) Avail: NTIS HC A02/MF A01

Thermally stable, poison tolerant catalysts for the hydrogenation or hydrodenitrogenation of nitrogen containing heterocycles typical of coal liquids were studied. Supported metallophthalocyanines were screened using quinoline at 1000 to 3000 psi. DOE

N82-27456# Physical Sciences, Inc., Woburn, Mass.
PULVERIZED-FUEL COMBUSTION: MODELING AND SCALEUP METHODOLOGIES Quarterly Report, 1 Jul. - 30 Sep. 1981
Paul F. Lewis and Nelson H. Kemp Dec. 1981 18 p refs
(Contract DE-AC22-80PC-30294)
(DE82-004790; DOE/PC-30294/4; QR-4) Avail: NTIS HC A02/MF A01

Models of small to medium scale pulverized fuel combustors were developed. Scaling laws for flame stability and carbon carry over were developed also. Work was confined to the data analysis task. A sample computation and the influence of various phenomena on the results are discussed. T.M.

N82-27457# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Subdiv. Systemes.
HUGONIOT'S CALCULATIONS ON COMPACT BORON FROM PROPERTIES AT NORMAL PRESSURE
M. Puech and J. P. Dupuis 10 Aug. 1981 7 p refs In FRENCH Presented at 8th AIRAPT Conf. and 19th EHPRG Conf., Uppsala, Sweden, 17-22 Aug. 1981
(SNIAS-821-422-107) Avail: NTIS HC A02/MF A01

Polar compact boron shock and its metastable phase were calculated from the sublimation energy and the speed of sound at zero pressure. The equations of state were formulated. The speed of sound in a dense monocrystalline boron sample was measured. Polar shock calculation results are compared with experiment. A solid phase change point is identified. The polar shock for the second phase was calculated. On verification, boron shows two phases, the polars of which are given. Author (ESA)

N82-27458# Coury and Associates, Inc., Lakewood, Colo.
AN EXPERIMENTAL PROJECT TO DETERMINE THE PARAMETERS OF SILICA SCALING IN REVERSE OSMOSIS SYSTEMS Technical Completion Report, Sep. 1979 - Apr. 1981
Michael C. Mickley and W. Martin Straley Apr. 1981 85 p refs
(Contract DI-14-34-0001-9526)
(PB82-157942; W82-02451; OWRT-C-90169-S(9526)(1)) Avail: NTIS HC A05/MF A01 CSCL 07D

The effects of silica supersaturation, temperature, pH, and brine composition and concentration on the concentration limits at which silica scaling occurs and on the mechanisms of silica scaling were investigated. Silica chemistry was found to be extremely complex, involving several different silica species and several mechanisms for removal of silica from solution. In addition, a wide variety of parameters were found to have effects on silica scaling, by affecting solubility, scaling mechanism, the kinetics of the mechanism, or a combination of these. A conceptual model of the types of silica scaling which may occur, and the situations in which they may occur is provided. Experimental data from laboratory experiments in glassware and small reverse osmosis systems consistent with the model is presented. GRA

N82-27459# National Bureau of Standards, Washington, D.C.
MODELLING OF OIL SHALE RETORTS FOR ELECTROMAGNETIC SENSING TECHNIQUES Final Report
H. Chew (Clarkson College, Potsdam, N. Y.) Nov. 1981 48 p refs Sponsored in part by DOE
(PB82-153321; NBSIR-81-1653) Avail: NTIS HC A03/MF A01 CSCL 07A

The feasibility of determining the void ratio of oil shale retorts by remote electromagnetic measurement is evaluated. The retort is modelled by a spheroid with an average dielectric constant which depends on the void ratio. The near field due to a radiating dipole source in the vicinity of a spheroidal retort is computed using the extended boundary condition method of Waterman, Barber, and Yeh. Numerical results are given at 4 MHz for a retort with major axis 45.7 (150 ft), minor axis 25.1 m (82.5 ft), bulk dielectric constant 8.8 + 3.7, and various void ratios. GRA

N82-27460# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
A NATIONAL FACILITY FOR THE STUDY OF HETEROGENEOUS CATALYSIS
J. B. Butt and L. H. Schwartz 1981 40 p Workshop held at Evanston, Ill., 8-9 May 1981
(Grant NSF CPE-80-24102)
(PB82-147828; NSF/CPE-81020) Avail: NTIS HC A03/MF A01 CSCL 07D

The need for expanded research in the field of heterogeneous catalysts, which contributes directly or indirectly to products accounting for at least one sixth of all the goods manufactured in the United States, was stressed. Three principal needs were addressed: (1) the difficulty in obtaining funds for acquisition of

valuable analytical techniques which have become critical in catalysts studies; (2) the desirability of increasing the number of trained scientists in the field; and (3) the need to organize the effort in a manner consistent with the needs of the field in the United States. A proposal for a national program in heterogeneous catalysts was presented. It suggests that several centers be funded to deal with both equipment needs and educational aspects of the field, and that these centers be attached to educational institutions. Selection of the centers would be made via evaluation of competitive proposals and location of the centers would be based on demonstrated capabilities and planned research programs. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-27461*# National Aeronautics and Space Administration, Washington, D. C.

EFFECTS OF VARIOUS ADDITIVES ON SINTERING OF ALUMINUM NITRIDE

Katsutoshi Komeya, Hiroshi Inoue, and Akihiko Tsuge Feb. 1982 20 p refs Transl. into ENGLISH from J. of the Ceram. Soc. of Japan (Japan), v. 89, no. 6, 1981 p 330-336 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Toshiba Research and Development Center, Kawasaki, Japan

(Contract NASw-3542)

(NASA-TM-76650; NAS 1.15:76650) Avail: NTIS HC A02/MF A01 CSCL 11F

Effects of thirty additives on sintering A/N were investigated. The addition of alkali earth oxides and rare earth oxides gave fully densified aluminum nitride. This is due to the formation of nitrogen-containing aluminate liquid in the system aluminum nitride-alkali earth oxides or rare earth oxides. Microstructural studies of the sintered specimens with the above two types of additives suggested that the densification was due to the liquid phase sintering. Additions of silicon compounds resulted in poor densification by the formation of highly refractory compounds such as A/N polytypes. Author

N82-27462*# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.

SOLUTE TRANSPORT DURING THE CYCLIC OXIDATION OF Ni-Cr-Al ALLOYS M.S. Thesis

James A. Nesbitt May 1982 140 p refs

(Grant NsG-3215)

(NASA-CR-165544; NAS 1.26:165544) Avail: NTIS HC A07/MF A01 CSCL 11F

Important requirements for protective coatings of Ni-Cr-Al alloys for gas turbine superalloys are resistance to oxidation accompanied by thermal cycling, resistance to thermal fatigue cracking. The resistance to oxidation accompanied by thermal cycling is discussed. The resistance to thermal fatigue cracking is also considered. S.L.

N82-27463# Tandem Accelerator Lab., Uppsala (Sweden).

MEASUREMENTS OF NITROGEN DEPTH DISTRIBUTION IN THE SURFACE OF STEEL WITH THE N-14(D,P SUB O)N-15 REACTION

R. Didriksson, L. Goenczi, and B. Sundqvist 1980 29 p refs (TLU-73-80) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The (14)N(d,p0) (15)N nuclear reaction was used to measure the nitrogen depth distribution in the surface of steel samples. With a beam energy of 2.5 MeV, a depth of 15(SIGMA)m could be analyzed. The depth resolution was 0.7 (SIGMA)m (FWHM) and nitrogen contents down to 0.02 percent could be determined. DOE

N82-27464# Dayton Univ., Ohio. Research Inst.

SPALL CRITERIA FOR SEVERAL METALS Final Report, Feb. 1979 - Dec. 1980

Stephan J. Bless Wright-Patterson AFB, Ohio AFWAL Jun. 1981 128 p refs

(Contract F33615-75-C-5124; AF Proj. 7351; AF Proj. 2307) (AD-A112445; UDR-TR-81-07; AFWAL-TR-81-4040) Avail: NTIS HC A07/MF A01 CSCL 11/6

Existing dynamic data are reviewed and new data are reported for spall type fracture in several metals. Fracture in OFHC copper was observed to be time dependent. Over driven spall in 1020 steel is better described by a time-independent spall stress of -45 kbar, and plastic strain of 0.03. However, experiments with conical targets indicated that this model is not entirely adequate for non 1-D strain states. Spall failure is 4340 RC30 steel did not appear to be rate dependent. The spall stress was -55 kbar. Spall in armor plate occurred at -60 kbar. In nickel 200, void coalescence was very gradual. Spall plate separation was virtually impossible in 1100 aluminum. The threshold stress for void formation was about -7 kbar. GRA

N82-27465# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering.

A FUNDAMENTAL STUDY OF TOOL STEELS PROCESSED FROM RAPIDLY SOLIDIFIED POWDERS Annual Report, Oct. 1980 - Sep. 1981

A. Lawley and M. J. Koczak Dec. 1981 55 p refs

(Contract N00014-81-K-0039)

(AD-A112758) Avail: NTIS HC A04/MF A01 CSCL 11/6

Powders of T15 and Rex 25 have been gas atomized and screened to specific particle size fractions to provide a spectrum of solidification rates, including the rapid solidification regime. Powders were then consolidated to full density by hot isostatic pressing. Atomized, annealed and consolidated powders of T15 have been characterized by means of optical and electron microscopy, X-ray diffraction and hardness. To date, a limited characterization of T15 after consolidation and heat-treatment has been accomplished. Similar studies have been initiated on the cobalt-free Rex 25 tool steel. Cubic and hexagonal MC carbides in the form of interconnected networks are present in each size fraction of atomized powder. Carbide size decreases and particle hardness increases with decreasing particle size. The dependence of particle hardness on particle size is understood in terms of cooling rate, solid solution strengthening, the constituents and scale of the matrix and carbides, and the partitioning of alloying elements between matrix and carbides. After hot isostatic pressing, carbides are in the form of individual particles; three carbides have been identified namely cubic MC, cubic M6C and cubic M23C6 in a matrix of alpha-ferrite. Carbide size increases as the isostatic pressing temperature increases and this results in a decrease in the hardness of the tool steel. For a given consolidation temperature, hardness is relatively independent of prior particle size fraction. Properties and performance will be assessed in terms of bend strength, C-notch impact, wear, grindability, life and dimensional control during heat-treatment. GRA

N82-27466# Newcastle-upon-Tyne Univ. (England).

THE OXIDATION AND CORROSION RESISTANCE OF NITRIDED IRON ALLOYS Annual Report, 1 Apr. 1979 - Mar. 1980

K. H. Jack 27 Jul. 1981 30 p refs

(Grant DA-ERO-79-G-0035; DA Proj. 1T1-61102-BH-57)

(AD-A107516) Avail: NTIS HC A03/MF A01 CSCL 11/6

Potentiokinetic measurements show that the corrosion resistance of austenitic Fe-34w/o Ni alloys containing Mo or Ti is increased by nitriding in NH3:H2 gas mixtures to form respectively a homogeneous distribution of 3Mo2N precipitates or a modulated structure of Ti-N clusters. Resistance to aqueous corrosion is also increased in alloys containing nitrogen in solid solution. A commercial nitrogen alloyed steel, Nitronic 50, which has excellent corrosion resistance in the annealed condition is heavily attacked when tested after removal of nitrogen. High temperature oxidation studies of ferritic iron alloys in static air have been completed. No significant differences in weight gain is detected between alloys tested in the annealed, the nitrided or the nitrided and aged conditions for Fe-5w/o Mo and Fe-2.32w/o Cr alloys but superior oxide adhesion is observed on nitrided pure iron and alloys containing a dispersion of incoherent nitrides. Experiments on nitrided mild steel oxidised at 600 C demonstrate the resistance to fracture of oxides formed on nitrided alloys. Author (GRA)

N82-27467# Ohio State Univ., Columbus. Dept. of Welding Engineering.

OPTIMIZATION OF PERFORMANCE OF ARC WELDING USING FLUXES IN WELDED SHIP STRUCTURES FROM HY-100 AND HY-130 KPSI Final Report, 1 Feb. 1975 - 31 Dec. 1978

Clarence E. Hackson, James T. Hickey, and Michael D. Hayes Sep. 1981 72 p refs

(Contract N00014-75-C-0666)

(AD-A107341) Avail: NTIS HC A04/MF A01 CSCL 11/6

The ability to weld steels with yield strengths over 100 ksi with the submerged arc process has been limited by a lack of fluxes and filler metals specifically designed for this purpose. This research program used commercially available filler wires that have been designed for gas metal arc welding and formulated flux compositions to limit the oxygen pickup in the weld metal. The effect of flux basicity on weld metal oxygen content was investigated. Experimental results with approximately 100 heats of fused flux indicated a definite trend of decreasing weld metal oxygen content with increasing flux basicity. In these tests the commercial fluxes produced weld metal with adequate toughness but low yield strength. In mechanical testing, the weld metal produced with experimental fluxes showed good tensile properties with inadequate impact values. The coarse microstructure of the last pass in the welds produced with experimental fluxes appears to be made up of untempered martensite, lower bainite, ferrite and proeutectoid ferrite. It is probable that the cracking observed was solidification cracking and may be related to the high phosphorus content of the weld metal. Additions of vanadium and molybdenum in the electrode or as oxides in the high purity flux may be effective in improving toughness. GRA

N82-27468# Pennsylvania State Univ., University Park. Applied Research Lab.

CORROSION MECHANISM OF Cu-9.4 Ni-1.7 Fe ALLOY IN 3.4 WT.% NaCl SOLUTION WITH AND WITHOUT SULFIDE CONTAMINATION Ph.D. Thesis

Chiaki Kato Naval Sea Systems Command 3 Aug. 1981 125 p refs

(Contract N00024-79-C-6043)

(AD-A107393; ARL/PSU/TM-81-181) Avail: NTIS HC A06/MF A01 CSCL 07/4

Corrosion products were developed on commercially available Cu-9.4 Ni-1.7 Fe alloy discs which rotated at 800 r.p.m. in 3.4 wt. % NaCl solution with and without sulfide contamination for various lengths of time up to 10 days. The developed corrosion products were characterized with X-ray diffraction, SEM, and ESCA studies. Anodic and cathodic polarization curves were measured on the corrosion-product covered alloy surface as well as on the fresh surface to study the electrochemical behavior of the alloy. The results show that (i) the weight loss of the alloy during immersion in clean solution increases with time according to a parabolic rate law which is due to the mass-transfer limited anodic metal dissolution rate, and (ii) the cathodic oxygen reduction reaction on the corrosion-product covered alloy in the clean solution is controlled by the poor catalytic nature of the corrosion products; however, this catalytic capability is improved by the addition of sulfide during the formation of the corrosion products, thus a high corrosion current is obtained in sulfide-polluted 3.4 wt. % NaCl solution. Author (GRA)

N82-27469# United Technologies Research Center, East Hartford, Conn.

DEFORMATION STUDIES IN WORKABLE SUPERALLOYS Final Report, 1 Oct. 1979 - 30 Sep. 1981

Anthony F. Giamei 30 Nov. 1981 58 p refs

(Contract F49620-80-C-0004; AF Proj. 2306)

(AD-A111113; R81-213713-1; AFOSR-82-0026TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

The second and final year of a workability study of nickel-base superalloys is now complete. The objective was to study the high strain plastic flow behavior of high strength superalloys in the form of single crystals, rapidly solidified ingots and consolidated powder particles. The single crystal alloy studied was PWA 1444 (similar to Mar-M200) which had previously been well characterized at low strains. The flow characteristics of this alloy have now been documented out to 15% strain as a function of crystal orientation. The low to intermediate temperature flow stress has been measured after forming. Remarkable work hardening has been obtained at low strains for high modulus crystals worked below the solvus temperature. Rapidly solidified and cooled ingots were made by arc melting or electron beam skull melting or induction melting and then 'drip melting' into a cold copper mold. The compositions and heat treatment were tailored to promote workability. Some of these buttons were heavily deformed in uniaxial compression under isothermal conditions below the gamma prime solvus temperature, and several were deformed in the single phase gamma region. High strains were achieved under conditions of constant displacement rate, true strain rate or energy input rate. GRA

N82-27470# Aeronautical Research Labs., Melbourne (Australia).

AN ASSESSMENT OF THE CORROSIVE POTENTIAL OF THE CHEMICALS USED IN PENETRANT TESTING TOWARDS AIRCRAFT STRUCTURAL MATERIALS

R. S. G. Devereux and L. Wilson Jul. 1981 12 p ref

(AD-A112191; ARL/MAT-NOTE-130; AR-002-300) Avail: NTIS HC A02/MF A01 CSCL 01/3

Various chemicals are used in non-destructive penetrant testing for cracks in aircraft structural materials. Tests have been carried out to assess the corrosive effect of these chemicals on aircraft aluminium alloys. These tests showed that the chemicals themselves are unlikely to have any deleterious effects. However, water used in removing the chemicals from the test area could cause surface corrosion and increase the rate of stress corrosion crack propagation if it is not removed at the conclusion of testing. GRA

N82-27471# Alloy Surfaces Co., Inc., Wilmington, Del.

EFFECT ON THERMAL LIFE OF LOW CHROMIUM CONTENT IN BD ACTIVATED CHROMIUM-IRON ALLOYS

David McCallister and A. L. Baldi 2 Feb. 1982 67 p

(Contract N00014-81-C-2514)

(AD-A112846) Avail: NTIS HC A04/MF A01 CSCL 11/6

Cr-Fe alloys were successfully produced by diffusing Cr into 1 mil 1010 steel foil stock. Uniform concentrations of Cr were provided throughout the complete foil thickness as determined by Electron Probe Analysis. After BD activation, the thermal energy and to a lesser degree the thermal life was reduced by the Cr addition. Concentrations from 0.25% Cr to 8.5% Cr were included in this study. The higher the Cr content, the lower the EPF and TPF values. Cr concentration of only 0.5% reduced the EPF value to 50% of that of the Cr-Free steel and 1% Cr and greater reduced the EPF close to O. Because of the higher negative free energy of formation of Chromium oxides over Iron oxides and because of the passive nature of Chromium, it was contemplated that small additions of Cr to steel would enhance both the thermal energy and thermal life properties. One explanation of the reverse effect by the Cr addition might be attributed to an unexpected reaction of the leached or partially leached Cr-Fe alloy with the leaching media during removal of the BD diffusion metal. One solution to the above problem might be to select another leaching media that would not react with the active Cr-Fe alloy. GRA

N82-27472# Aluminum Co. of America, Alcoa Center, Pa.

EFFECT OF MICROSTRUCTURE ON 7XXX ALUMINUM ALLOY FATIGUE CRACK GROWTH BEHAVIOR DOWN TO NEAR-THRESHOLD RATES Final Report, 1 Jul. 1979 - 30 Jun. 1981

P. E. Bretz, A. K. Vanudevan, R. J. Bucci, and R. C. Malcolm 3 Oct. 1981 115 p refs

(Contract N00019-79-C-0258)

(AD-A112721) Avail: NTIS HC A06/MF A01 CSCL 11/6

This investigation was undertaken to clarify the role of microstructure on steady state (constant load amplitude) and transient (single periodic overload) fatigue crack growth behavior in 7XXX aluminum alloys at low stress intensity factor ranges (delta K). These results were consolidated with data in the literature to obtain an understanding of microstructural effects on crack growth response over a broad delta K range. Constant load amplitude data show that there are significant differences in near-threshold FCG resistance among 7XXX alloys. Overaging to a T7 temper reduces low delta K FCG resistance greatly, whereas intermediate and high delta K FCG resistance is increased by overaging. In the presence of moisture at intermediate delta

K levels, increasing Cu content from 1.0 to 2.3% increases crack growth resistance. However, there is no consistent effect of Cu content on near-threshold fatigue performance. Similarly, no clear influence of dispersoid type (Cr vs. Zr) on low delta K FCG resistance was detected. Increasing alloy purity (lowering Fe, Si content) enhances crack growth resistance at high delta K, but has no effect at near-threshold stress intensities. The importance of near-threshold FCG performance to alloy design and materials selection for fatigue resistance is discussed. Potential tradeoffs between design philosophies which emphasize damage tolerance characteristics vs those which focus on improved life cycle economics are examined. GRA

N82-27473# SRI International Corp., Menlo Park, Calif.
DIP PROCESS THERMAL BARRIER COATING FOR SUPERALLOYS Annual Report, 14 Dec. 1980 - 14 Dec. 1981
I. M. Allam and D. J. Rowcliffe 2 Feb. 1982 57 p refs
(Contract F49630-81-K-0009; AF Proj. 2306; SRI Proj. 2509)
(AD-A112342; AFOSR-82-0177TR) Avail: NTIS
HC A04/MF A01 CSCL 11/6

A new, cerium oxide-base thermal barrier coating for superalloys has been investigated. Cerium oxide is promising as a thermal barrier because of its low thermal conductivity and its relatively high coefficient of thermal expansion, suggesting good compatability with superalloys. The coating is applied by hot-dipping superalloys substrates into a molten bath of low-melting cerium-nickel alloy. Annealing and selective oxidation of cerium at low oxygen activities produce a duplex coating of a continuous outer layer of cerium oxide (CeO2) and an inner composite cerium oxide/substrate layer. The effect of coating composition and processing variables on the micro-structure and integrity of the coating on nickel- and cobalt-base alloys was studied in detail. The best, thin, crack-free coatings were produced on MAR-M509 with a coating alloy of Ce-30% Ni. Isothermal and cyclic oxidation tests showed that coating spallation could occur and was associated with the oxidation of nickel and cobalt incorporated in the coating. A model for the formation of the CeO2 barrier and the subscale region is proposed that accounts for the presence of unwanted nickel and cobalt; methods for avoiding their presence are proposed. Author (GRA)

N82-27474# Naval Ship Research and Development Center, Bethesda, Md. Ship Materials Engineering Dept.
DYNAMIC J SUB I-R CURVE TESTING OF HY-130 STEEL
J. A. Joyce and E. J. Czyryca Oct. 1981 35 p refs
(SF61541592)
(AD-A107040; DTNSRDC/SME-81-57) Avail: NTIS
HC A03/MF A01 CSCL 11/6

The J-integral crack growth resistance properties of HY-130 steel were developed under dynamic loading conditions. The objective of this program was to extend the key curve method to evaluate ductile fracture properties of HY-130 steel compact specimens where the loading rate produced a load-line crack-opening displacement rate on the order of 9-inches per second. A key curve for HY-130 plate was developed under dynamic loading conditions using subsized specimens and was applied to tests of 1TCT Specimens. Results of ambient temperature tests showed that both J sub Ic and the tearing modulus of this steel were substantially elevated under dynamic loading. The fracture process of specimens tested under dynamic and static loading conditions was found to be similar and completely ductile. Author (GRA)

N82-27475# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
THE EFFECT OF GRAIN AND CARBINE REFINEMENT ON THE ISOTHERMAL TRANSFORMATION CHARACTERISTICS OF AISI 52100 STEEL M.S. Thesis
Duane M. Tufte Sep. 1981 75 p refs
(AD-A112229) Avail: NTIS HC A04/MF A01 CSCL 11/6

A study of the microstructure and mechanical properties of isothermally-transformed AISI 52100 bearing steel was conducted. Standard spheroidized annealed and thermomechanically grain-refined materials were compared. Heat treatment consisted of austenitization at 850 C, followed by isothermal transformation at 350 C, 275 C or 250 C. Hardness, retained austenite, and optical and transmission electron microscopy data were obtained as a function of isothermal transformation time. Tensile test results also were obtained on selected conditions. It was found that isothermal holding above M sub s resulted in comparable hardness values for both materials. Retained austenite remained low for all cases but did tend to increase as the M sub s was approached. Microstructural analysis revealed that the fine-grain structure of the refined material was retained throughout the transformations while little or no difference in the carbide structure was noted. Tensile results show that the refined and transformed material exhibits greater strength and ductility. Author (GRA)

N82-27476# United Technologies Research Center, East Hartford, Conn.
A STUDY OF THE DEPENDENCE OF MICROSEGREGATION ON CRITICAL SOLIDIFICATION PARAMETERS IN RAPIDLY QUENCHED STRUCTURES Annual Technical Report, Aug. 1980 - Sep. 1981
David B. Snow, L. E. Greenwald, and E. M. Breinan Jan. 1982 55 p refs
(Contract N00014-79-C-0649; NR Proj. 031-825)
(AD-A113674; UTRC/R82-914763-6) Avail: NTIS
HC A04/MF A01 CSCL 11/6

Grade AH32 structural hull steel clad with varying thicknesses of 317L stainless steel were bead-on-plate welded with a continuous, CO2 laser operated at power settings of from 2 to 9 kW and scanned at 5 to 76 cm/sec. The resulting fusion zone shapes and microstructures were examined by light microscopy and electron microprobe to determine the variation in welding efficiency and fusion zone segregation as a function of beam power input and cladding thickness. Due to the similarity in thermal conductivity and reflectivity of the cladding and substrate, the degree of the dilution of chromium and nickel in the fusion zone depended only on the relative volumes of cladding and substrate mixed in it, and not the absolute values of cladding thickness or fusion zone depth. Welding efficiency increased with power and beam traverse speed at constant fusion zone depth. GRA

N82-27477# Georgia Inst. of Tech., Atlanta. School of Physics.
ION IMPLANTATION STUDIES OF TITANIUM METAL SURFACES Final Report
James R. Stevenson, Keith O. Legg, and Martin W. Ribarsky 1981 58 p refs
(Grant AF-AFOSR-0011-79; AF Proj. 2303)
(AD-A113782; AFOSR-82-0327TR) Avail: NTIS
HC A04/MF A01 CSCL 11/6

The influence of implants on the surface characteristics and oxidation of titanium and the use of various techniques to probe the surface structure have been studied. The surface condition of the metal was shown to affect greatly the implant distribution. Erbium implants did not segregate at all to a clean titanium surface but segregated completely to a carbon covered surface. Initial monolayer oxide formation is unaffected by implanted calcium, which does not segregate to the surface. The electronic structure of the oxide layer is, however, unexpectedly complicated, showing features in the electron energy loss spectrum very different from the clean surface. It is shown that care must be taken in studying the loss spectrum itself, especially in identifying the plasmon loss peaks and features associated with the clean surface. It has been found that different implants can seriously affect mechanical strain in the oxide, leading to rumpling and spalling in the case of Ti or Sb implants. These effects appear to be associated with implant segregation to the metal-oxide interface. A semiquantitative electron channeling method has been developed for determining damage levels in implanted materials. GRA

N82-27478# Johns Hopkins Univ., Baltimore, Md. Center for Materials Research.
CHARACTERIZATION OF RAPIDLY SOLIDIFIED ALLOYS Report for 1 Aug. 1981 - 1 Jan. 1982
Emanuel Horowitz and D. Shechtman Jan. 1982 31 p refs
(Contract MDA903-81-C-0555; ARPA Order 4344)
(AD-A113688; CMR-DARPA-1) Avail: NTIS
HC A03/MF A01 CSCL 11/6

During the reporting period, advances were made in three main areas of study, dealing with the following: the Al-Fe system;

Pd(77)Si(17)Cu(6); the Phrasor powders. All three studies are designed to further our understanding of different phenomena that occur in the rapid solidification of useful metallic systems. We now have a better understanding of the structure and the solidification sequence of rapidly solidified Al-Fe alloys containing up to 34 wt % Fe. In rapidly solidified ribbons of Pd(77)Si1(7)Cu(6) we were able to detect the first stages of crystallization following heat treatments, and then to observe the advancement of the crystallizing front. We had the first look at two of the Phrasor powders, with a particle size which starts at about 3nm, and detected some phenomena which are inherent to the technique. The only technical problem encountered during the reporting period was related to foil preparation for the Scanning Transmission Electron Microscope (STEM), involving a few alloys, based mainly on silver. These difficulties are expected to be resolved with the purchase of a new ion miller and then these systems will be reinvestigated. GRA

N82-27479# Brown Univ., Providence, R. I. Center for Dynamical Systems.

ON THE STEADY-STATE CONTINUOUS CASTING STEFAN PROBLEM WITH NON-LINEAR COOLING Interim Report

Michel Chipot and Jose-Francisco Rodrigues Jan. 1982 33 p refs

(Contract DAAG29-79-C-0161; Grant AF-AFOSR-0198-81; AF Proj. 2304)

(AD-A113884; AFOSR-82-0277TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

A steady-state one phase Stefan problem corresponding to the solidification process of an ingot of pure metal by continuous casting with a non-linear lateral cooling is considered via the weak formulation introduced in BKS for the dam problem. Two existence results are obtained for a general non-linear flux and for a maximal monotone flux. Comparison results and the regularity of the free boundary are discussed. An uniqueness theorem is given for the monotone case. Author (GRA)

N82-27480# Massachusetts Inst. of Tech., Cambridge. Corrosion Lab.

HYDROGEN INDUCED INTERGRANULAR CRACKING OF NICKEL-BASE ALLOYS Final Technical Rept.

R. M. Latanision Feb. 1982 21 p refs

(Contract N00014-78-C-0002; NR Proj. 036-127)

(AD-A113425) Avail: NTIS HC A02/MF A01 CSCL 11/6

This final report is intended to summarize the activities pursued during the course of a program directed toward an evaluation of the susceptibility of nickel and nickel-base alloys to embrittlement by cathodically produced hydrogen. The transport of hydrogen by lattice and grain boundary diffusion, as well as by mobile dislocations, has been examined. Author (GRA)

N82-27481# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.

THE INFLUENCE OF PLASTIC ANISOTROPY ON THE LOCALIZED NECKING OF Ti-6Al-4V

K. S. Chan (Stanford Univ.), K. I. Weinmann, and D. A. Koss Jan. 1982 9 p refs

(Contract N00014-76-C-0037; NR Proj. 031-756)

(AD-A112932; TR-17) Avail: NTIS HC A02/MF A01 CSCL 11/6

The influence of plastic anisotropy on the localized necking behavior of strongly textured Ti-6Al-4V sheet has been investigated. Tensile tests as well as punch-stretch tests have been performed on strongly textured sheet with either normal or planar anisotropy and with R-values ranging from 0.5 to 12. In uniaxial tension, a high R-value increases the post-uniform elongation but has no significant effect on the uniform elongation. The effects of the R-value on the forming limit diagram depends on the loading path. A high R-value enhances the limit strain at the onset of localized necking in the negative minor strain region, but has little or no effect at plane strain. The dependence of the limit strain on the R-value in the negative minor strain region of the forming limit diagram can be understood in terms of a critical thickness strain criterion. Fracture appears to intervene prior to localized necking in the positive minor strain region of the FLD. Author (GRA)

N82-27482# Ad-Ex International, Portola Valley, Calif.

SHOCK WAVES IN MEDIA WITH PHASE TRANSITIONS

S. M. Bakhrakh, V. N. Zubaryev, and A. A. Shanin Sep. 1981 15 p refs Transl. into ENGLISH from Mater. of 3rd Natl. Symp. on Combust. and Detonation, 1972 p 554-560 Symp. held in Moscow, 5-10 Jul. 1971 Prepared for California Univ., Lawrence Livermore Lab.

(DE82-001070; UCRL-Trans-11722) Avail: NTIS HC A02/MF A01

A great deal of experimental material was accumulated on the phase transitions of substances subjected to dynamic effects. A comparison of experimental results indicates that substances must be divided into two groups. The basis for this division is the comparison of the pressure at the phase equilibrium line p/sub e/ with the pressure (p/sub g/) at which phase transitions appear in dynamic experiments (the pressure of the break on the shock adiabatic curve). It is characteristic for the first group (KCL, KBr, Fe, Bi, etc.) that p/sub g/ approx. = p/sub e/, that is the pressure need be only very slightly over p/sub e/ for phase transition to occur in some tenths of a microsecond. In the second group (C, BN, SiO2 and a few others) pressure p/sub g/ is several times greater than p/sub e/. In this case, restructuring of the initial phase lattice occurs by an essentially nonequilibrium path; in addition to the phase equilibrium line there is also a line of threshold pressure p/sub g/, upon passage through which the rate of phase transition increases greatly. Naturally, these differences in phase transition are related to the kinetics of the transitions, and the kinetic equations must be considered in their theoretical analysis. DOE

N82-27483# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).

INDUSTRIAL APPLICATIONS RELATING TO SUPERPLASTIC FORMING OF TA6V TITANIUM ALLOY: MANUFACTURING OF HEMISPHERICAL BANKS AND TRUNCATED CONES WITH INTERNAL FLANGES

J. Chanteranne 1981 5 p In FRENCH; ENGLISH summary Presented at 24th INSTN Coll. de Metallurgie, Saclay, France, Jun. 1981

(SNIAS-821-422-113) Avail: NTIS HC A02/MF A01

Superplastic forming processes for TA6V which enable an economy of this material were developed. The forming of hemispherical blanks for satellite tanks is explained. After stabilizing the material in an oven at 925 C, two plates welded together around the edges are expanded within a mold by forcing gas between them. A surface elongation of 250% is obtained, achieving a precise form of good metallurgical and mechanical quality. This process was modified in order to manufacture deep blanks (400% surface elongation) of truncated form with local internal margins that can be machined into flanges. A material mass savings on the order of 40% in comparison to die stamping is reported. Author (ESA)

N82-27484# Bureau of Mines, Avondale, Md. Research Center.

PYROMETALLURGICAL RECOVERY OF CHROMIUM FROM SCRAP METALS: LABORATORY STUDIES

Charles L. Kusik, Krishna Parameswaran, David J. Kinneberg, and Harry V. Makar Oct. 1981 49 p refs Prepared in cooperation with Little (Arthur D.) Inc., Cambridge

(PB82-135476; BM-RI-8571; LC-81-1047) Avail: NTIS HC A03/MF A01 CSCL 11F

The feasibility of recovering chromium from critical scrap metals containing significant quantities of this element based on a conceptual pyrometallurgical chromium recovery flowsheet, the experimental program described in this report demonstrated keyprocess steps for the recovery of chromium as ferrochromium in a batch process. The process involves oxidation of chromium into a slag phase, subsequent separation of the slag phase from the remaining metal, followed by reduction of chromium from the slag phase to produce ferrochromium. GRA

N82-27485# Bureau of Mines, Avondale, Md.

CORROSION RESISTANCE OF MATERIALS IN THE AQUEOUS HYDROCHLORIC ACID ENVIRONMENTS ASSOCIATED WITH THE RECOVERY OF ALUMINUM FROM KAOLINITIC CLAYS

Bernard S. Covino, Jr., Murray Rosen, and William D. Riley Oct.

1981 35 p refs
(PB82-135526; BM-RI-8565) Avail: NTIS HC A03/MF A01 CSCL 11F

A laboratory and field corrosion testing program was conducted to determine materials of construction for the leaching and gas-sparging crystallization environments of the clay-HCl process in order to more fully utilize the alumina from domestically available kaolinitic clays. Laboratory tests were used to determine the corrosion rates of 22 metals and alloys by weight-loss measurements in these two environments of the process. Results from the field tests were used to recommend Ta, Ta-2.5W, and Ta-10W for construction of the agitators for the leaching process. The metals and alloys recommended for construction of the gas-sparging crystallizer heat exchangers were Ta, Ta-2.5W, Ta-10W, Nb, Nb-1Zr, Nb-3Zr, Nb-28Ta-10W1Zr, Nb-10Hf-1Ti, and Zr for the first stage and Ta, Ta2.5W, Ta-10W, Nb-28Ta-10W-1Zr, Nb, Nb-10Hf-1Ti, and Zr for the second stage. Author (GRA)

N82-27383*# Massachusetts Inst. of Tech., Cambridge.
CONVECTION IN GRAIN REFINING
M. C. Flemings and J. Szekely *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 23-46 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27384*# Massachusetts Inst. of Tech., Cambridge.
EXPERIMENTAL PROGRAM ON NUCLEATION AND STRUCTURE IN UNDERCOOLED MELTS
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 46-72 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27385*# Massachusetts Inst. of Tech., Cambridge.
THE STRUCTURE AND PROPERTIES OF RAPIDLY SOLIDIFIED HIGH ALLOY ALUMINUM MATERIALS
N. J. Grant *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 73-78 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27387*# Massachusetts Inst. of Tech., Cambridge.
DEVELOPMENT OF RAPIDLY SOLIDIFIED OXIDATION RESISTANT ALLOYS
G. J. Yurek *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 90-93A (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27391*# Massachusetts Inst. of Tech., Cambridge.
STUDIES OF METALS ELECTROPROCESSING IN MOLTEN SALTS
D. R. Sadoway *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 120-122 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27395*# Massachusetts Inst. of Tech., Cambridge.
IRRADIATION EFFECTS IN RAPIDLY AND CONVENTIONALLY SOLIDIFIED ALLOYS. PHASE STABILITY IN RAPIDLY SOLIDIFIED N I-Nb UNDER Ni ION IRRADIATION
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 175-184 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27400*# Massachusetts Inst. of Tech., Cambridge.
SOLIDIFICATION PROCESSING
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 228-240 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27402*# Massachusetts Inst. of Tech., Cambridge.
ELECTRO PROCESSING RESEARCH
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 241-244 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

N82-27405*# Massachusetts Inst. of Tech., Cambridge.
METALS PROCESSING
In its Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 268-284 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-27486*# North Carolina State Univ., Raleigh.
EFFECT OF 1.33 Mev GAMMA RADIATION AND 0.5 Mev ELECTRONS ON THE MECHANICAL PROPERTIES OF GRAPHITE FIBER COMPOSITES
R. E. Fornes, J. D. Memory, and N. Naranong [1982] 17 p refs
(Grant NsG-1562-S2)
(NASA-CR-169117; NAS 1.26:169117) Avail: NTIS HC A02/MF A01 CSCL 11G

Epoxy/graphite fiber, polyimide/graphite fiber, and polysulfone/graphite fiber composites were exposed to 1.33 Mev gamma irradiation and 0.5 Mev electron bombardment for varying periods of time. The effects of the irradiation treatments on the breaking stress and Young's modulus were studied by a three point bending test. Effects were small; both electron radiation up to 5000 Mrad and gamma radiation up to 350 Mrad resulted in slight increases in both stress and modulus. M.G.

N82-27487# National Timber Research Inst., Pretoria (South Africa).
SULPHITED WATTLE TANNIN-BASED ADHESIVES FOR GLULAM ASSEMBLY
F. A. Cameron and A. Pizzi Sep. 1980 12 p refs
(CSIR-SR-HOUT-209; ISBN-0-7988-2091-8) Avail: NTIS HC A02/MF A01

The manufacture of glued laminated beams of industrial dimensions with an adhesive based on sulphited wattle tannin, which at a 10% resorcinol content, can be cured at a temperature of 50 C is discussed. Accelerated life weathering tests, moisture resistance tests, and shear strength tests are described. R.J.F.

N82-27488# National Timber Research Inst., Pretoria (South Africa).
MODIFIED FAST-SETTING PHENOLIC AND TANNIN-BASED ADHESIVE SYSTEMS FOR EXTERIOR GRADE FINGER JOINTS
F. A. Cameron and A. Pizzi Dec. 1980 20 p refs
(CSIR-SR-HOUT-207; ISBN-0-7988-2074-8) Avail: NTIS HC A02/MF A01

Ten adhesive systems were tested on mechanically finger jointed South African Pine of dimensions 5,000 mm x 120 mm x 37 mm and Eucalyptus Saligna and Eucalyptus grandis, of dimensions 5,000 mm x 75 mm x 25 mm. All the adhesive systems tested performed sufficiently well in developing enough strength to allow short delay between assembling and machining or dispatching. These systems were unable to satisfy the requirements of the British Standard 1204 specification for close contact adhesives. The reason for the consistent failure of these systems to pass the beech strip cold water resistance test was investigated. The first series of tests was to assess the suitability of the beech strip test for adhesives to be used for end joint application. It was established that the beech strip test is suitable. The second series of tests involved improving the adhesive system to the extent that it consistently passed the British Standard BS 1204 specification. Since it was the cold water resistance test that always failed to meet the relevant specification, it appeared that the amount of cross linking in the adhesive was inadequate. R.J.F.

N82-27489# National Timber Research Inst., Pretoria (South Africa).

FAST-SETTING PHENOLIC AND TANNIN-BASED HONEYMOON ADHESIVE SYSTEMS FOR EXTERIOR GRADE GLUED LAMINATED TIMBER

F. A. Cameron, A. Pizzi, and D. Mosterd Feb. 1981 14 p refs

(CSIR-SR-HOUT-211; ISBN-0-7988-2098-5) Avail: NTIS HC A02/MF A01

A fast setting two component adhesive system was used to manufacture exterior grade finger jointed timber on an industrial scale. Ten different adhesive systems were tested at 25 C and found to build up sufficient strength to permit machining of the timber after a time delay of only half an hour to one hour. Although these adhesive systems worked well in end joint application, they were unable to pass the beech strip (Fagus sylvatica) test for close contact adhesives as specified in the British standard 1204, and in the provisional specification for synthetic resin adhesives for wood. Experiments conducted with two of the adhesive systems, applied to small, two layer beams, to determine the effectiveness of the system in glulam manufacture is discussed. R.J.F.

N82-27490# National Timber Research Inst., Pretoria (South Africa).

MINIMUM CURING TEMPERATURE OF COLD-SETTING AND FAST-SETTING HONEYMOON LAMINATING ADHESIVES

F. A. Cameron and A. Pizzi Feb. 1981 22 p refs

(CSIR-SR-HOUT-212; ISBN-0-7988-21027) Avail: NTIS HC A02/MF A01

The minimum curing temperature of two cold setting laminating adhesives and four fast setting 'honeymoon' adhesives, was determined by the ability of the adhesive system to meet the weather and boil proof requirements of the British standard specification BS 1204 for synthetic resins adhesive for close contact joints, and the South African Bureau of Standards provisional specification, for exterior grade wood adhesives at the temperature chosen. The cold setting wattle tannin based and phenolic one component adhesive cannot be cured at temperatures of 20 C and below. Two of the 'honeymoon' systems can be cured at temperatures above 15 C. One of the 'honeymoon' systems can be cured at temperatures above 10 C. The completely phenolic 'honeymoon' system can be cured at a temperature as low as 5 C and possibly lower with little reduction in the rate of development of bond strength. S.L.

N82-27491# National Timber Research Inst., Pretoria (South Africa).

THE RELATIONSHIP BETWEEN RESIN SOLIDS CONTENT AND CURED STRENGTH OF TWO COLD-SETTING LAMINATING ADHESIVES

F. A. Cameron and A. Pizzi Mar. 1981 16 p refs

(CSIR-SR-HOUT-213; ISBN-0-7988-2108-6) Avail: NTIS HC A02/MF A01

The results of performance tests and adhesive strength tests of two cold-setting laminate adhesives are presented. The commercial wattle-tannin adhesive satisfies all the weather and boil proof requirements of the British standard specification BS 1204 in a percentage resin solids content range of 43% to 59%, and of the South African Bureau of Standards draft specification for exterior wood adhesives in a range of 53% to 59% resin solids content. The commercial phenol/resorcinol/formaldehyde adhesive satisfies all the weather and boil proof requirements of the British standard specification BS 1204 in a percentage resin solids content range of 42% to 54%, and of the South African Bureau of Standards draft specification for exterior wood adhesives at 52% and 54% resin solids content. J.D.

N82-27492# National Timber Research Inst., Pretoria (South Africa).

VARIATION IN THE PROPORTION OF THE A AND B COMPONENTS OF HONEYMOON ADHESIVE SYSTEMS USED FOR EXTERIOR GRADE FINGER JOINTS

F. A. Cameron and A. Pizzi Mar. 1981 16 p refs

(CSIR-SR-HOUT-215; ISBN-0-7988-2109) Avail: NTIS HC A02/MF A01

In the 'Honeymoon' adhesive systems the A component contains hardener so that an excess of A over B component, or lack of the B component results in slow curing but to a satisfactory strength. The B component does not contain hardener and therefore an excess of B component over A component results in very little or no curing. For this reason a wattle tannin based and a phenolic fast setting 'Honeymoon' adhesive system were tested to determine the maximum variation in proportion of B to A component at which the cured strength of the adhesive would be unaffected. The wattle tannin based adhesive system can be safely used at a 3:1 variation in proportion of B to A component. The phenolic adhesive system can be used at as much as a 5:1 variation in the proportion of B to A component. S.L.

N82-27493*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SYNTHESIS AND CHARACTERIZATION OF A MELT PROCESSABLE POLYIMIDE

Harold D. Burks and Terry L. St.Clair May 1982 32 p refs Proposed for presentation at the Soc. of Plastic Engr. 1st Tech. Conf. on Polyimides, Ellenville, N.Y., 10-12 Nov. 1982

(NASA-TM-84494; NAS 1.15:84494) Avail: NTIS HC A03/MF A01 CSCL 11C

A melt processable polyimide which contains sulfur and oxygen bridges between the aromatic rings (BDSDA/APB) was synthesized and characterized. Its physical, mechanical, thermal and flow properties were determined as was its resistance to some of the more commonly used solvents. The melt flow properties were measured for the temperature range 250 C - 350 C and under the conditions (stress/strain) encountered in commercial processes. Author

N82-27494*# Martin Marietta Corp., Denver, Colo.

EVALUATION AND PREDICTION OF LONG-TERM ENVIRONMENTAL EFFECTS ON NONMETALLIC MATERIALS Final Report

May 1982 61 p refs

(Contract NAS8-33578)

(NASA-CR-162043; NAS 1.26:162043; MCR-82-530) Avail: NTIS HC A04/MF A01 CSCL 11G

Changes in functional properties of a broad spectrum of nonmetallic materials as a function of environment and exposure time were evaluated. Models for predicting long-term material performance are discussed. A literature search on specific materials in the space and simulated space environment was carried out and evaluated. N.W.

N82-27495*# Texas A&M Univ., College Station. Plastics Engineering Lab.

CAPILLARY RHEOMETRY FOR THERMOSETS

S. C. Malguarnera and D. R. Carroll [1982] 16 p refs Sponsored by NASA

(NASA-CR-169122; NAS 1.26:169122) Avail: NTIS HC A02/MF A01 CSCL 11B

Capillary rheometry is effectively used with thermosets. Most important is providing a uniform temperature in the barrel. This was successfully accomplished by using a circulating hot oil system. Standard capillary rheometry methods provide the dependence of thermoset apparent viscosity on shear rate, temperature and time. Such information is very useful in evaluating resin processability and in setting preliminary fabrication conditions. S.L.

N82-27496# Brown Univ., Providence, R. I. Dept. of Chemistry.

VIBRATIONAL SPECTRA OF OXYGEN- AND BORON-ISOTOPICALLY SUBSTITUTED B2O3 GLASSES

Charles F. Windisch and William M. Risen, Jr. 15 Sep. 1981 43 p refs Submitted for publication

(Contract N00014-75-C-0883; NR Proj. 051-539)

(AD-A107333; TR-81-02) Avail: NTIS HC A03/MF A01 CSCL 07/4

The Raman spectra of 10B, 11B, 16O, 18O, and mixed isotopic compositions of B2O3 (gl) are reported. The 808/cm band assigned to the boroxol ring structure is found to shift upon oxygen isotope substitution, and not to depend on the boron mass. It is replaced by four bands, in the intensity ratio

1:3:3:1, in the case of the 50% 16O-50% 18O-containing material. On the other hand, the frequencies other principal bands depend on the masses of both boron and oxygen. The ca 1260/cm band, in particular, depends on the masses of both, and shifts without broadening upon partial oxygen substitution. The analysis of these data shows that both a local unit, behaving as predicted for the boroxol ring, and a continuous random network of connecting bonds are manifested in the spectra. Author (GRA)

N82-27497# Queen Mary Coll., London (England). Dept. of Materials.

ENVIRONMENTAL FAILURE OF ADHESIVE BONDING IN COMPOSITES Final Report

E. H. Andrews, Ho Ping Sheng, H. A. Majid, and C. Ylachos May 1981 48 p refs

(Grant DA-ERO-78-G-118; DA Proj. 1T1-61102-BH-57)

(AD-A107538) Avail: NTIS HC A03/MF A01 CSCL 11/4

A recently developed fracture mechanics test (the A-S test), which involves pressurisation of an enclosed circular flaw, has been used to investigate the adhesion of two epoxy resins (Shell Epikote 828 and 3 M's SP 250) to glass. Specimens were tested after various times of immersion in water at 80 C and the adhesive failure energy theta determined. The effects of adding silane coupling agents to the epoxy resin and the influence of water pH were particularly studied. The theory of generalized fracture mechanics is used to derive, from theta, an intrinsic failure failure energy theta sub 0 which is the energy to break unit area of interatomic bonds across the interface. The decrease of theta sub 0 with time follows first order reaction kinetics, with a rate constant controlled by the type and concentration of coupling agent as well as by the pH of the aqueous environment. The results are interpreted in terms of the chemical hydrolysis of interfacial bonds. Author (GRA)

N82-27498# California Univ., Berkeley. Dept. of Chemical Engineering.

TIME-DEPENDENT MORPHOLOGIES AND VISCOELASTIC PROPERTIES OF BLOCK COPOLYMERS Technical Report, 1 May 1981 - 15 May 1982

Jeffrey C. Kelterborn and David S. Soong 15 Mar. 1982 91 p refs Submitted for publication

(Contract N00014-81-K-0516)

(AD-A112472; TR-1) Avail: NTIS HC A05/MF A01 CSCL 11/9

Dynamic mechanical properties of block copolymers over a wide temperature range have been previously correlated with the phase-separated microstructure of these systems. In the present work the morphology of the block copolymer is altered by large tensile deformation at various temperatures. Upon removal of the applied stress the morphological features of such stretched-and-released systems become functions of time, as the non-equilibrium microstructure reverts to a thermodynamically stable state. This reformation process is monitored by dynamic mechanical measurements with a modified torsion pendulum capable of applying both tensile and torsional deformation. Experimental results are analyzed using a modified Nielsen model to obtain information on the time-dependent structural state of the samples. These results are then compared with stress-strain curves to provide further insight into the structure breakdown-reformation mechanisms. Two competing mechanisms, domain fracture and block pull out, are proposed to explain these experimental observations. Author (GRA)

N82-27499# Kingston Polytechnic, Kingston-Upon-Thames (England).

THE FRACTURE OF THERMOSETTING RESINS AFTER EXPOSURE TO WATER Annual Report

Geoffrey Pritchard, R. G. Rose, W. E. Douglas, J. Ghotra, and D. Ho Sep. 1981 32 p refs

(Contract DAJA37-79-C-0505; DA Proj. 1T1-61102-BH-57)

(AD-A107237; AR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

This report considers the importance of molecular weight and molecular weight distribution in determining (a) the hydrolytic stability and (b) the fracture toughness of thermosetting resins. Experimental work (still incomplete) is described. Several orthophthalic polyester resins have been prepared and characterised, and some of them fractionated by precipitation with solvent: non-solvent mixtures. The fracture parameters, hot water resistance and property retention characteristics of the original resins are being compared with those of the fractions, with a two year period of immersion in distilled water at 50 C. Medium and high molecular weight fractions show improved hot water resistance. Molecular weight distributions are being measured by gel permeation chromatography and adjusted by combinations of synthetic, blending and fractionating procedures.Author (GRA)

N82-27500# Utah Univ., Salt Lake City. Dept. of Chemistry.

STUDIES OF ELASTIC PROPERTIES OF STRETCH FILMS OF POLYCARBONATE BY BRILLOUIN SCATTERING

Quan-L. Liu and C. H. Wang 22 Feb. 1982 33 p refs Submitted for publication

(Contract N00014-79-C-0507)

(AD-A112208; TR-9) Avail: NTIS HC A03/MF A01 CSCL 11/9

Results of the Brillouin scattering study of polycarbonate (PC) films stretched at a temperature slightly above Tg are reported. The elastic constants C11, C13, C33, and C44 are determined as a function of stretched ratio. Using the affine orientational model recently developed by Wang and Cavanaugh, the orientation parameter is obtained as a function of stretched ratio. The changes in the elastic constants and the orientation parameter are discussed in terms of chain morphology. The results in PC films are found to be significantly different from other polymer films, such as poly(ethylene terephthalate) and isotactic polypropylene, recently investigated in this laboratory. The reason for the difference is discussed. Author (GRA)

N82-27501# Army Materiel Development and Readiness Command, Alexandria, Va.

ENGINEERING DESIGN HANDBOOK. DISCONTINUOUS FIBERGLASS REINFORCED THERMOPLASTICS

Apr. 1981 383 p refs

(AD-A106942; DARCOM-P-706-314) Avail: NTIS HC A17/MF A01 CSCL 11/9

This handbook provides information related principally to families of thermoplastics reinforced with strand 'E' glass. The handbook content, while limited to molding materials, advises the reader that other forms of thermoplastic materials-such as foams and elastomers-are also glass reinforced. The wealth of detail and information presented will acquaint US Army Material Development and Readiness Command personnel with the range of available materials and their unique mechanical, electrical, and physical properties; fabrication processes, including joining, together with their advantages and disadvantages; and areas of glass-reinforced thermoplastics (GRTP) application. Thus potential uses of GRTP's-with their attendant lower cost and ease of production-are suggested for the design and procurement of Army material. The handbook features the relationships between the GRTP's and their properties-the relationships are displayed both in tabular form and graphically. The influence of composite variables-volume of glass fiber; glass strand solids and bundle size; glass filament diameter, length, and orientation-on properties are similarly displayed. Another unique feature of the handbook is the manner in which the polymers and their associated properties are presented. In one breakout, the GRTP's are displayed as the independent variable; in a second breakout, the properties are displayed as the independent variable. GRA

N82-27502# IBM Research Lab., San Jose, Calif.

THE (13)C NMR OF AsF5 DOPED POLYACETYLENE

T. C. Clarke and J. C. Scott 8 Sep. 1981 11 p refs Submitted for publication

(Contract N00014-80-C-0779)

(AD-A107167; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Natural abundance C13 NMR experiments using cross polarization and magic angle spinning are reported for polyacetylene as a function of AsF5 doping level. In contrast with previous authors we find that the doping of cis-polyacetylene leads, even at low doping levels, to a new signal characteristic of the doped regions of the polymer. Similar measurements on trans-polyacetylene indicate that the doping of the trans isomer proceeds considerably more uniformly than that of the cis osomer. Comparisons with appropriate model compounds suggest that

the observed shift of the C13 NMR signal on doping is primarily a chemical shift rather than a Knight shift. Author (GRA)

N82-27503# IBM Research Lab., San Jose, Calif.
THE CHEMISTRY OF POLYACETYLENE DOPING
T. C. Clarke, B. W. McQuillan, J. F. Rabolt, J. C. Scott, and G. B. Street 31 Aug. 1981 20 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A107165; TR-5) Avail: NTIS HC A02/MF A01 CSCL 11/9

Natural abundance 13C Nuclear Magnetic Resonance experiments using cross polarization and magic angle spinning provide a unique method for monitoring the doping of polyacetylene. In contrast with previous authors we find that the doping of cis-polyacetylene with AsF5 leads, even at low doping levels, to a new signal characteristic of the doped regions of the polymer. Similar measurements on trans-polyacetylene indicate that the doping of the trans isomer proceeds considerably more uniformly than that of the cis isomer. Comparisons with appropriate model compounds suggest that the observed shift of the 13C NMR signal on doping is primarily a chemical shift rather than a Knight shift. Finally we discuss recent results on the nature of proton acid doping of polyacetylene, a process which shows remarkable similarities to oxidative doping. Author (GRA)

N82-27504# IBM Research Lab., San Jose, Calif.
PREPARATION AND CHARACTERIZATION OF NEUTRAL AND OXIDIZED POLYPYRROLE FILMS
G. B. Street, T. C. Clarke, M. T. Krounbi, K. K. Kanazawa, V. Y. Lee, P. Pfluger, J. C. Scott, and G. Weiser 31 Aug. 1981 14 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A107166; TR-6) Avail: NTIS HC A02/MF A01 CSCL 11/9

Oxidized and neutral films of polypyrrole have been prepared electrochemically in the absence of oxygen and water. The neutral films are insulating and can be readily oxidized by chemical oxidizing agents to give films of greater conductivity than can be achieved by electrochemical oxidation. Optical spectroscopy provides evidence for the similarity of the polymeric carbonium ion produced by both types of oxidation. NMR studies are consistent with the alpha, alpha' bonding in these polymers; they also show the expected downfield shifts relative to the neutral polymer on both chemical and electrochemical oxidation. Electron Spin Resonance studies of both the electrochemically oxidized and the neutral polymer suggest the presence of highly mobile spins. Author (GRA)

N82-27505# SRI International Corp., Menlo Park, Calif.
SYNTHESIS OF ENERGETIC POLYMERS Summary Report, 15 Jul. 1980 - 14 Jul. 1981
G. E. Manser and Donald L. Ross 15 Oct. 1981 60 p refs
(Contract N00014-79-C-0525; NR Proj. 093-063; SRI Proj. PYU-8627)
(AD-A107498; SRI-8627) Avail: NTIS HC A04/MF A01 CSCL 07/3

Three general synthetic routes to the preparation of energetic oxetanes and tetrahydrofurans were investigated during the first year of the program. Subsequently, 3-(2-fluoro-2,2-dinitroethyl-3-methyloxetane (FOE) was prepared and polymerized to give oligomers with molecular weights ranging from 6,000 to 15,000. Efforts to develop a general synthetic route to 3-nitroalkyl substituted oxetanes starting with methylene malonate were not successful. However, work on an alternative general route to oxetanes afforded oxetane 3,3-diacetic acid in low yield. This material could be used to prepare a series of nitro esters of oxetane, but this work was terminated as our experience has shown that cationic polymerization of esters does not produce significant conversion of the monomer. Work on a general route to nitroalkyl-substituted tetrahydrofurans resulted in 3-(2,2-dinitropropyl)tetrahydrofuran (3-DNPTHF), which was prepared using a synthetic route of general applicability to other 3-substituted tetrahydrofurans. A preliminary polymerization study yielded dimer and trimer, suggesting that polymerization was possible. GRA

N82-27506# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
CORROSION TESTS WITH MIL-H-83282 AND MIL-H-6083 AIRCRAFT HYDRAULIC FLUIDS Final Report
Alfeo A. Conte, Jr. 25 Jan. 1982 12 p
(WF6154200)
(AD-A112437; NADC-81301-60) Avail: NTIS HC A02/MF A01 CSCL 11/8

Corrosion tests were performed to determine whether MIL-H-83282 hydraulic fluid could be used in place of MIL-H-6083 preservative fluid in Intermediate Maintenance Activity (IMA) and NAVAIREWORKFAC hydraulic test stands. The results presented in this report show that MIL-H-83282 can not be considered as a suitable alternative fluid. Author (GRA)

N82-27507# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
INTERCALATED COMPOUNDS: A NEW CLASS OF MATERIALS AS ADVANCED SOLID LUBRICANTS Progress Report
Alfeo A. Conte, Jr. 25 Jan. 1982 22 p refs
(AD-A112453; NADC-81247-60) Avail: NTIS HC A02/MF A01 CSCL 11/8

The results presented in this report demonstrate that the process of intercalation, i.e., the formation of chemical compounds via insertion of atomic or molecular species in the van der Waals gap between planes of lamellar solids can substantially improve the intrinsic lubricating properties of solids. Using graphite as a model host compound, various transition metals and metal chlorides intercalated into graphite were formulated into solid film lubricants and their lubricating properties determined in a laboratory wear test device. Comparisons of endurance life and load carrying capacity are made relative to molybdenum disulfide and unintercalated graphite. Graphite/19.8 wt. % CoCl2 was found to exhibit over a five-fold increase in endurance life while graphite/19.3 wt. % NiCl2 provided a greater than two-fold increase in load carrying capacity relative to graphite and was equivalent to MoS2. The degree of improvement in endurance life was found to be dependent on the concentration of intercalant in graphite and the resulting increase in interlayer carbon spacing due to intercalation. A total of 23 different intercalate compounds were investigated at various concentration levels. GRA

N82-27508# Stanford Univ., Calif. Dept. of Chemistry.
THE STRUCTURE AND PROPERTIES OF POLYMERIC MATERIALS Final Scientific Report, 1 Feb. 1977 - 30 Sep. 1981
Paul J. Flory 29 Mar. 1982 7 p
(Grant AF-AFOSR-3293-77; AF Proj. 2303)
(AD-A113963; AFOSR-82-0302TR) Avail: NTIS HC A02/MF A01 CSCL 11/9

Research on the theory of liquid crystalline systems has been continued with special emphasis on systems of semiflexible polymer chains. Experiments on low molecular analogs have been carried out with the primary object of assessing the effects of anisotropic phase. It has been demonstrated that anisotropy of the molecular polarizability, which can be evaluated by optical measurements of depolarized Rayleigh scattering (DRS), is directly responsible for the effect. The density of the fluid has been found to play an important role, not hitherto recognized. It must be taken into account in any quantitative treatment of liquid crystallinity in low molecular substances at high temperatures. The theory of rubber elasticity of real polymeric networks has been refined and generalized. In its revised form the theory gives a good account of the relationship of stress to strain for all strains, including biaxial deformations, throughout experimentally accessible ranges. The principal parameter required, apart from the degree of interlinking that characterizes the network structure, appears to be related to the degree of interpenetration in the network. This parameter, too, may be subject to evaluation, also from molecular characteristics. Thus, the theory provides an essential link between molecular structure and properties. Author (GRA)

N82-27509# SRI International Corp., Menlo Park, Calif.
SILICON NITRIDE JOINING Annual Report, 1 Dec. 1980 - 31 Jan. 1982
R. E. Loehman, M. L. Mecartney, and D. J. Rowcliffe 8 Feb.

1982 30 p refs
(Contract F49620-81-K-0001; AF Proj. 2306)
(AD-A113977; SRI-PYU2527; AFOSR-82-0304TR) Avail: NTIS HC A03/MF A01 CSCL 11/2

The objective of this program is to investigate joining of ceramics through reactions between oxynitride melts and silicon nitride. The basis of the approach is to use joining materials that duplicate the composition of intergranular phases that exist in different types of hot-pressed or sintered Si_3N_4. A method has been devised to calculate average intergranular compositions from bulk analysis of Si_3N_4. Calculated compositions are similar to those determined by analytical electron microscopy. Oxynitrides that simulate the grain boundary phases in NC132 and NCX34 hot-pressed Si_3N_4 were prepared and used in joining experiments. The minimum joint thickness was 15 microseconds. The integrity of the joints is strongly dependent on the composition of the joining material and on the reaction temperature, but appears independent of the pressure of the nitrogen atmosphere, between 30 and 300 psi. Transmission electron microscopy studies of joined materials suggest that the liquid bonding material reacts with the ceramic surface, dissolving Si_3N_4 and penetrating into the ceramic. At the same time silicon oxynitride laths grow across the interface to form the joint. Author (GRA)

N82-27510# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.

ION BEAM METHODS FOR THE SURFACE CHARACTERIZATION OF POLYMERS Final Report, Jan. - Jul. 1981

William L. Baun Feb. 1982 45 p refs
(AF Proj. 2303)
(AD-A114012; AFWAL-TR-81-4169) Avail: NTIS HC A03/MF A01 CSCL 20/7

Ion beam methods of surface characterization have not been applied extensively to polymers and other organic materials, but would appear to be very useful for these materials. Applications of high energy ion beam methods would seem to be limited except for specific cases but low energy methods such as ion scattering spectrometry (ISS) and secondary ion mass spectrometry (SIMS) should have numerous uses with polymeric materials. ISS is a true surface method which determines elemental composition at the first monolayer, but tells little about how the elements are combined. SIMS has high sensitivity for many elements, and has the capability of determining something of the molecular structure near the surface. Both ISS and SIMS, as well as high energy methods, give elemental composition with depth. These surface spectroscopies are useful in many areas of polymer technology including synthesis, extrusion and forming, and long time durability and stability under thermal and electromagnetic radiation. Author (GRA)

N82-27511# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.

PITCH FRACTIONATION

V. L. Weinberg and J. I. White 15 Dec. 1981 49 p refs
(Contract F04701-81-C-0082)
(AD-A113805; TR-0082(2935-02)-1; SD-TR-81-90) Avail: NTIS HC A03/MF A01 CSCL 07/4

Petroleum pitch (Ashland A240) has been subjected to thermal treatment and solvent fractionation to produce refined pitches to be evaluated as impregnants for carbon-carbon composites. The solvent fractions were obtained by sequential Soxhlet extraction with solvents such as hexane, cyclohexane, toluene, and pyridine. The most severe thermal treatment produced a mesophase pitch (approximately 50% mesophase); an appreciable portion of the mesophase was soluble in strong solvents. There were substantial differences in chemical composition and in pyrolysis behavior of the fractions. As the depth of fraction increased, the pyrolysis yield and bloating increased, and the microstructure of the coke became finer until glassy microconstituents were formed in the deepest fractions. GRA

N82-27512# Dayton Univ., Ohio. Research Inst.

EVALUATION OF PLASMA SOURCE SPECTROMETERS FOR THE AIR FORCE OIL ANALYSIS PROGRAM Interim Report, 30 Aug. 1977 - 30 Sep. 1980

Wendell E. Rhine, Costandy S. Saba, Robert E. Kauffman, John R. Brown, and Patricia S. Fair Wright-Patterson AFB, Ohio AFWAL Feb. 1982 354 p refs
(Contract F33615-76-C-5312; AF Proj. 2303)
(AD-A113809; AFWAL-TR-82-4017) Avail: NTIS HC A16/MF A01 CSCL 14/2

An investigation was conducted in order to evaluate two plasma source emission spectrometers for use in the Air Force Oil Analysis Program (OAP). The high temperatures of the plasma sources were expected to improve the Oil Analysis Program's capability to analyze wear metal particulates. The work is presented in two phases. Phase I of the work dealt with determining the capabilities of the two plasma instruments as well as the currently used OAP spectrometers. During this phase of the work the sample introduction systems were identified as the reason each instrument could not detect particles larger than 3-10 Microns. Phase 2 of the work dealt with optimizing the sample introduction systems so that particles could be more efficiently transported where they could be analyzed. The improved systems were capable of analyzing particles as large as 14-20 Microns. GRA

N82-27513# Arizona Univ., Tucson. Dept. of Chemistry.

FABRICABLE POLYMERS FOR MATRICES AND ADHESIVES WHICH ARE EXTREMELY STABLE TO HEAT, OXIDATION AND HYDROLYSIS Final Report, 1 Oct. 1976 - 31 Dec. 1981

Carl S. Marvel 31 Dec. 1981 7 p
(Grant AF-AFOSR-3112-77; AF Proj. 2303)
(AD-A113933; AFORS-82-0292TR) Avail: NTIS HC A02/MF A01 CSCL 11/9

The report covers work on preparation of polyaromatic ketones, polyaromatic sulfones from diphenyl ether, and iso- and terephtaloyl chloride with diphenyl units which can be used to crosslink polymers. We have also worked on the polyether-keto-sulfones and polyesters, polyaromatic amides, and polyaromatic esters of aromatic diphenols. GRA

N82-27514# Arizona Univ., Tucson. Dept. of Chemistry.

A COMPARISON OF THREE METHODS FOR THE DETERMINATION OF WEAR METALS IN LUBRICATING OILS: DIRECT INTRODUCTION-ICP, SOLVENT DILUTION-AAS, AND ASHING-AAS

J. D. Algeo and M. B. Denton 20 Jan. 1982 18 p refs
(Contract N00014-75-C-0513)
(AD-A113468; TR-31) Avail: NTIS HC A02/MF A01 CSCL 11/8

A new method for the analysis of wear metals in lubricating oils which utilizes a modified Babington Principle nebulizer is compared to two other existing methods. The new method is found to be faster and more convenient than the others. When compared to the results from an existing solvent dilution method, the results from the new method show a stronger correlation to those of a reference method. Author (GRA)

N82-27515# Fraunhofer-Inst. fuer Silicatforschung, Wuerzburg (West Germany).

FLUORINE EMISSION DURING CERAMIC FIRING Final Report

Gerhard Tuenker, Helmut Schmidt, and Horst Scholze Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-231; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14.70

Mechanisms of fluorine emission of clay minerals and ceramic batches were investigated in a laboratory furnace by quasi-continuous monitoring of the concentration in the flue gas. Ceramic batches are often contaminated by fluorine as an impurity in the clay and as a consequence, volatile fluorine compounds are emitted during the firing process. For thermodynamic reasons, the stability of the fluorine bond during the firing process is not high enough. Fluorine emission is strongly affected by a water vapor-containing firing atmosphere. The specimen's microstructure is very important especially with regard to mass transfer, e.g., HF and H_2O, the porosity, in particular. A reduced flourine emission level is attained for many ceramic batches by optimizing the firing conditions. Another practice method is the application of glazes with a gloss firing behavior that essentially seals off the

surface before the maximum flourine emission rate is reached.
Author (ESA)

N82-27516# Bayerisches Geologisches Landesamt, Munich (West Germany).
THE BOREHOLES ORTENBURG 1 AND 2 (1980/81) Final Report
Helmut Gudden and Hubert Schmid Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-004; ISSN-0340-7608; Rept-203.1.8-IV/2C)
Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7.40

Prospecting on the Ortenburg plateau is described. Permian and mesozoic sedimentary rocks of the variscan orogene area are often U, Cu, Pb and Cu bearing, especially layers of reduced thickness and reducing environment as well as the border between crystalline basement and overlying rocks. The outcrops of these rocks are well investigated except where the prospected series are covered by younger formations. The few borings in this region corroborate their interest. Therefore, the boreholds Ortenburg 1 and 2 were sunk, reaching the crystalline basement by a 1 m clastic layer, under tertiary, cretaceous and mesozoic rocks. Chemical analyses show amounts up to 0.15% Pb and 0.1% Cu in the weathered basement and the clastic layer. At the basement top there are peaks in the Gamma Log with intensities of 2x to 3x crystalline background. Author (ESA)

N82-27517# National Bureau of Standards, Washington, D.C. Center for Fire Research.
AN EVALUATION OF THE MSHA TEMPERATURE-PRESSURE SPRAY IGNITION TEST FOR HYDRAULIC FLUIDS Final Report
Joseph J. Loftus, Adalberto Maldonado-Rosado, and Paula J. Allen Sep. 1981 45 p refs Sponsored in part by Bureau of Mines, and Mine Safety and Health Administration
(PB82-131806; NBSIR-81-2373) Avail: NTIS HC A03/MF A01 CSCL 11H

The Mine Safety and Health Administration (MSHA) temperature-pressure spray ignition test for determining the fire resistance of hydraulic fluids was evaluated in spray ignition tests on 14 different hydraulic fluids including water glycols, synthetics, and invert emulsions. Results of these and of other tests designed to evaluate the test method and its procedures are discussed.
GRA

N82-27518# National Bureau of Standards, Washington, D.C.
RELATIONSHIP BETWEEN MORPHOLOGY AND MECHANICAL PROPERTIES OF ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE Annual Report, 9 Dec. 1979 - 30 Sep. 1980
G. B. McKenna, F. A. Khoury, and J. M. Crissman Apr. 1981 64 p refs Sponsored in part by the Food and Drug Administration
(PB82-139072; NBSIR-81-2209(FDA)) Avail: NTIS HC A04/MF A01 CSCL 11I

Aspects of the morphology of the constituent particles of a raw ultra high molecular weight polyethylene (UHMWPE) were examined using scanning electron microscopy. Differential scanning calorimetry was used to determine the melting point (413K) and the crystallinity (78%) of the raw polymer. Protocols estalished for the preparation of compression molded sheets of UHMWPE having crystallinities of 50% and 602 are presented. A memory of the particulate nature of the raw polymer is retained in the sheets. The following aspects of the mechanical behavior of the molded sheets have been examined; stress-strain behavior at constant rate of clamp separation, creep and single step stress relaxation in uniaxial extension, and failure under both static and sinusoidal loading conditions. GRA

N82-27386*# Massachusetts Inst. of Tech., Cambridge.
RAPID QUENCHING EFFECTS IN GLASSY POLYMERS
F. J. McGarry *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 79-89 refs (For primary document see N82-27382 18-23)
Avail: NTIS, HC A13/MF A01 CSCL 11C

N82-27390*# Massachusetts Inst. of Tech., Cambridge.
NUMERICAL MODELING AND OPTIMIZATION OF POLYMER MELT PROCESSING OPERATIONS
David Roylance *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 117-119 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11C

N82-27397*# Massachusetts Inst. of Tech., Cambridge.
LASER PROCESSING
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 198-209 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 11C

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-27519*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SOME NITROGEN COMPOUNDS THERMAL STABILITY OF JET A
Albert C. Antoine Jun. 1982 20 p refs
(NASA-TM-82908; NAS 1.15:82908) Avail: NTIS HC A02/MF A01 CSCL 21D

The effect of known concentrations of some nitrogen containing compounds on the thermal stability of a conventional fuel, namely, Jet A was investigated. The concentration range from 0.01 to 0.1 wt% nitrogen was examined. Solutions were made containing, individually, pyrrole, indole, quinoline, pyridine, and 4 ethylpyridine at 0.01, 0.03, 0.06, and 0.1 wt% nitrogen concentrations in Jet A. The measurements were all made by using a standard ASTM test for evaluating fuel thermal oxidation behavior, namely, ASTM D3241, 'thermal oxidation stability of turbine fuels (JFTOT procedure).' Measurements were made at two temperature settings, and 'breakpoint temperatures' were determined. The results show that the pyrrole and indole solutions have breakpoint temperatures substantially lower than those of the Jet A used. S.L.

N82-27520# Georgetown Univ., Washington, D.C. Dept. of Chemistry.
FRACTIONATION OF DIESEL FUEL FROM PETROLEUM AND PARAHO SHALE OILS Final Report
Charles F. Hammer Oct. 1981 22 p refs
(Contract N00167-76-M-8549; ZF45451001)
(AD-A107042; DTNSRDC/SME-80/212) Avail: NTIS HC A02/MF A01 CSCL 21/4

A fractionation scheme has been developed to separate diesel fuels into neutral water solubles, acidic components, basic components, saturated hydrocarbons, substituted benzenes, polycyclic aromatic hydrocarbons, and polar neutrals. A sample of conventional petroleum diesel fuel and a sample of diesel fuel derived from Paraho crude shale oil by the Gary-Western process were fractionated by this procedure. Each fraction was further analyzed by gas chromatography and proton magnetic resonance spectroscopy. The petroleum sample was found to contain 17.5% total aromatics of which 9.5% were polycyclic aromatic hydrocarbons compounds. However, the Paraho-Gray Western shale oil fuel contained about twice as much total aromatics (38.2%) and polycyclic aromatic hydrocarbons compounds (19.3%). The total acyclic hydrocarbon straight chain compounds content was 66.7% for the petroleum sample and 59.3% for the Paraho-Gary Western shale sample. Suggestions for further work are also made. Author (GRA)

N82-27521# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
IGNITION OF COMPOSITE PROPELLANTS UNDER RAPID PRESSURE LOADING Summary Report, 1 Aug. 1980 - 31 Jul. 1981

Mridul Kumar, Kenneth K. Kuo, Anil K. Kulkarni, and John E. Wills Sep. 1981 170 p refs
(Contract N00014-79-C-0702)
(AD-A107147) Avail: NTIS HC A06/MF A01 CSCL 21/9

A comprehensive theoretical model for ignition of composite solid propellants was proposed as a framework for formulating ignition models for different propellants under a wide range of operating conditions. Detailed chemical kinetics information for the AP/PBAA propellants was incorporated into the proposed theoretical model for ignition of composite solid propellants, enabling a more complete description of source terms in the gas-phase energy and species equations. Solid-phase energy equations were coded and implemented on a computer. Numerical solutions of the solid-phase subprogram were successfully checked against analytic solutions for some limiting cases. Using actual measured heat flux near the propellant surface as an input to the solid-phase equations, predictions for the ignition delay time were made. Effects of pressurization rate, crack-gap width, and igniter-flame temperature on the ignition of AP-based composite solid propellants located at the tip of an inert crack were studied. The ignition process was observed by using a high speed camera (-40,000 pictures/s) and a fast response photodiode system. Heat flux to the propellant surface was measured with a thin film heat flux gage. A bright luminous zone behind the reflected compression wave was observed at high pressurization rates. The decrease in ignition delay with increasing pressurization is caused by enhanced heat feedback to the propellant surface at higher pressurization rates. GRA

N82-27522# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
SUITABILITY OF SHALE FUELS FOR ARMY GENERATOR SETS Interim Report, May 1980 - Sep. 1981
A. F. Montemayor Dec. 1981 69 p refs
(Contracts DAAK70-80-C-0001; DAAK70-82-C-0001; DA Proj. 1L7-62733-AH-20)
(AD-A112609; AFLRL-142) Avail: NTIS HC A04/MF A01 CSCL 21/4

Gasoline, diesel, and gas turbine generator sets were examined to determine which shale fuel properties might adversely affect their performance. Information from engine manufacturers, fuel system manufacturers, U.S. Army Troop Support and Aviation Readiness Command (USATSARCOM) personnel and existing literature was consulted to identify existing/potential problems. Known shale fuel properties were presented and compared to military specifications. Generator sets were separated into major grouping by the fuel systems they employ. A listing of generator sets was included in order to facilitate generator set selection for testing. In general, the performance of shale fuels seemed to be comparable to that of petroleum fuels. Long-term problems such as elastomer degradation, poor life, and difficult cold weather starting may manifest themselves if refiners are unable to meet military specifications. Based on the fuels produced to date, refiners should be able to meet specifications and provide shale fuels suitable for generator set operation. Several fuel properties not covered in military specifications (such as lubricity and hydrocarbon composition) were seen as potential problem areas. A recommended test procedure has been provided to test the areas of concern presented in this report. Author (GRA)

N82-27523# Amoco Oil Co., Naperville, Ill. Research and Development Dept.
EVALUATION OF HYDROCRACKING CATALYSTS FOR CONVERSION OF WHOLE SHALE OIL INTO HIGH YIELDS OF JET FUELS Final Report, Dec. 1979 - Oct. 1981
A. M. Tait and A. L. Hensley Wright-Patterson AFB, Ohio AFWAL Oct. 1981 196 p refs
(Contract F33615-79-C-2095; AF Proj. 3048)
(AD-A112820; M81-65; AFWAL-TR-81-2098) Avail: NTIS HC A09/MF A01 CSCL 21/4

A catalyst development and screening program has led to a formulation capable of upgrading whole shale oil into high yields of military jet fuel in a single operation. The catalyst is multifaceted in its functionality in that it sequentially saturates, denitrogenates, and hydrocracks the feedstock in the presence of high levels of contaminants, such as organic nitrogen compounds and ammonia, while maintaining a high selectivity towards jet-fuel, boiling range material. The catalyst, developed by optimization of both chemical and physical properties, consists of 1.5% cobalt oxide, 10% chromium oxide, and 15% molybdenum oxide on a support of 50% ultrastable molecular sieve in alumina. The effectiveness of the catalyst for the direct upgrading of an Occidental whole shale oil was demonstrated in a 100-day test. The feed, containing approximately 15 weight percent material boiling within the range for JP-4 and containing 13,000 ppm nitrogen, was upgraded to a water-white product containing 1 to 3 ppm nitrogen and approximately 75% JP-4 material. The hydrogen consumption required for this level of upgrading and conversion was approximately 1800 SCFB. The catalyst developed represents an advance in shale oil upgrading technology over more conventional petroleum-based technology. Author (GRA)

N82-27524# Simmonds Precision Products, Inc., Vergennes, Vermont.
COMMERCIAL AIRCRAFT AIRFRAME FUEL SYSTEMS SURVEYS Interim Report, Oct. 1980 - Oct. 1981
P. G. Weitz Atlantic City FAA Feb. 1982 55 p refs
(Contract DTFA03-80-C-0080)
(AD-A112241; E-2304; FAA-CT-82/12) Avail: NTIS HC A04/MF A01 CSCL 20/4

A selection of commercial aircraft airframe fuel systems has been studied to determine areas where incompatibility with antimisting kerosene fuel (AMK) may exist. Incompatibility can be due to reduced fuel system component performance with AMK or shear degradation of the AMK by the fuel system components. Survey results, to date, indicate that potential component performance problems with AMK are more significant than loss of AMK flammability protection due to shear degradation. Components of interest include ejector pumps, fuel filters, and auxiliary power units. The solubility of water in AMK and its effect on fuel system performance under actual operating conditions is also of major importance. Author (GRA)

N82-27525# Calspan Advanced Technology Center, Buffalo, N.Y.
EXTINCTION CHARACTERISTICS OF PYROTECHNICALLY GENERATED ALKALI HALIDE SMOKES
J. T. Hanley, B. J. Wattle, and E. J. Mack Dec. 1981 42 p refs
(Contract N00019-81-C-0125)
(AD-A112806; CALSPAN-6855-M-1) Avail: NTIS HC A03/MF A01 CSCL 17/4

The major findings realized from this year's effort are: (1) At approx. 40% RH, the NWC 90 and NWC 164 pyrotechnics appear to provide greater extinction at IR wavelengths longer than approx. 7 micron relative to the other pyrotechnics. This performance may be due to the graphite component of the NWC 90 and NWC 164 aerosol. (2) At approx. 75% RH, extinction produced by NWC 29, NWC 78, NWC 79, NWC 90 and NWC 164 is approximately a factor of four greater than that provided by CY85A. (3) At approx. 90% RH, all six pyrotechnics provide approximately the same degree of extinction effectiveness. (4) The nominal mass yields for the six pyrotechnics appear equivalent. Values ranged from 28 to 37%. (5) Based on SEM analyses of individual particles in the size range 0.2 to 1.9 micrometer, no evidence was seen supporting a significant particle size-chemical composition relationship for the evaluated pyrotechnics. (6) The eutonic mixture of $MgCl_2$ - NaCl and the estimated eutonic mixtures of $MgCl_2$ - NaI provided no decrease in the deliquescence humidity relative to the deliquescence humidity of pure $MgCl_2$. (7) The eutonic mixture of NaCl - KCl provided a 2% RH decrease in the humidity at which deliquescence began relative to pure NaCl. GRA

N82-27526# Hercules, Inc., Radford, Va.
DEHUMIDIFIED AIR FOR DRYING SINGLE-BASE PROPELLANT Final Report, Aug. 1979 - Aug. 1981
William Y. Garth Dover, N.J. Army Armament Research and Development Command Feb. 1982 86 p refs
(Contract DAAG09-77-C-4007)
(AD-A112329; AD-E400781; ARLCD-CR-8200) Avail: NTIS HC A05/MF A01 CSCL 19/1

The purpose of this project was to reduce the present expenditure of thermal energy during the drying of single-base propellant by using dehumidified heated air as the drying medium. Results of this study show that the use of dehumidified air for

drying single-base propellant is neither cost nor energy efficient. However, the study does show that the installation of a plate type air-to-air heat exchanger between the exhaust and intake air streams will effect an annual energy savings of 679,000 kg (1,498,000 lb) of stream for a cost savings of approximately $6,400 per air dry unit/year. GRA

N82-27527# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF ENGINE AND TEST CELL OPERATING CONDITIONS ON THE EFFECTIVENESS OF SMOKE SUPPRESSANT FUEL ADDITIVES M.S. Thesis
Donald Wendell Thornburg Dec. 1981 103 p refs
(Contract N6237681-WR-00014)
(AD-A112800) Avail: NTIS HC A06/MF A01 CSCL 13/2

Tests were conducted in a one-eighth scale turbojet test cell with a ramjet type combustor to investigate the effects of fuel additives on smoke reduction. Particle size and mass concentrations were determined at the engine and stack exhaust using three wavelength optical detector systems. Particulate samples were also collected at the engine exhaust and analyzed with a scanning electron microscope. Combustor temperature and fuel additives were found to significantly affect particulate mass concentrations emitted from the engine while particle size appeared to be unaffected. No significant changes in the particulate size or mass occurred from the engine exhaust to the stack exhaust. The optical determination of exhaust mean particulate size/mass concentration with three wavelength optical detector systems appears to be a good and reasonably accurate technique for evaluating the effects of engine and test cell operating conditions and fuel composition changes on the emitted particulates. Author (GRA)

N82-27528# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1 PHASE G, SERIES, I, TP-H1011
John A. Thompson Feb. 1982 129 p
(AD-A114058; MAKPH-465(82)) Avail: NTIS
HC A07/MF A01 CSCL 21/9

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRBA Project M04046C. The data from this test period are combined with data from previous testing and entered into the G085 Computer for storage, analysis, and regression analysis. From the statistical analysis of all data tested to date (fifteen and one-half years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point. Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 System. GRA

N82-27529# Miami Univ., Coral Gables, Fla. Dept. of Physics.
ANALYTICAL STUDIES OF NON-IDEAL EXPLOSIVES Final Report
Manuel A. Huerta 15 Dec. 1981 50 p refs
(Grant AF-AFOSR-0135-80; AF Proj. 2301)
(AD-A113080; AFOSR-82-0182TR) Avail: NTIS
HC A03/MF A01 CSCL 21/2

Qualitative results are obtained for detonation failure due to expansion losses. The equations for the Mach number and the reaction progress variable are integrated approximately. For certain loss ranges two detonation speeds are obtained. The slow one is actually the deflagration root that evolves beyond Mach one. For larger losses detonation failure occurs. Author (GRA)

N82-27530# Department of Energy, Bartlesville, Okla. Energy Technology Center.
LIQUID FOSSIL FUEL TECHNOLOGY Quarterly Technical Progress Report, Apr. - Jun. 1981
Oct. 1981 72 p
(DE82-004725; DOE/BETC/QPR-81/2) Avail: NTIS
HC A04/MF A01

Highlights of progress made during the quarter ending June, 1981, are presented. Cation exchange capacity of oil and gas wells was determined using a semi-automated procedure. The equivalent alkane carbon number (EACN) was determined for Delaware-Childers oil. It was shown that for this oil, the type of surfactant and alcohol used causes the EACN to vary on unusual amount. Arsenic compounds from samples of Green River oil shale kerogen was identified (both inorganic and organometallic compounds). The concepts of adsorption isotherm, used for determining the thermodynamic properties of surfactant systems, has undergone some changes in order to better represent the physical model. A derivation of the new ideas and their application to immersion measurements are described. A method for analysis of alcohols in water, hydrocarbon mixtures, or exhaust gases was developed. The method, which utilizes two gas chromatographs, analyzes methanol, ethanol, and other alcohols up through the C4 group. DOE

N82-27531# Pittsburg and Midway Coal Mining Co., Englewood, Colo.
SOLVENT REFINED COAL (SRC) PROCESS. FLASHING OF SRC-2 SLURRY IN THE VACUUM COLUMN ON PROCESS DEVELOPMENT UNIT P-99: SUPPLEMENTARY EXPERIMENTS WHILE PROCESSING IRELAND MINE COAL Interim Report, Sep. - Dec. 1980
J. A. Gray Aug. 1981 63 p refs
(Contract DE-AC05-76ET-10104)
(DE82-004482; DOE/ET-10104/18) Avail: NTIS
HC A04/MF A01

The vacuum flash system was tested during SRC-II processing of an 11% ash Ireland Mine coal. Vacuum flash separation data at well defined flash zone pressures on slurry produced from Ireland Mine coal was obtained in order to supplement 12 earlier experiments on this coal in which problems arose in the measurement of pressures in the vacuum column. The 9000 F distillate content of the vacuum bottoms and the percent of feed slurry flashed overhead correlated well with flash zone operating conditions. The data for the 11% ash Ireland Mine coal were very similar to those for the Powhatan No. 6 Mine coal. Data for the Powhatan No. 5 Mine (9% ash) and the previous shipment of Ireland Mine (16% ash) coals were quite different compared to results for the other coals due to different levels of ash in these coals and, hence, significantly different vacuum column feed slurry compositions. Polymerization and cracking were negligible. Specific gravity and melting point of the products correlated well with vacuum column operating conditions. Elemental, distillation, and solvent balances showed the data to be of reasonably good quality. DOE

N82-27532# Stearns-Roger Corp., Denver, Colo.
BI-GAS PILOT PLANT Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1981
1981 80 p refs
(Contract DE-AC01-80ET-14705)
(DE82-004753; DOE/ET-14705/26) Avail: NTIS
HC A05/MF A01

The plant is designed to process a maximum of 5 tons per hour of coal. It is a facility designed to study all phase of coal conversion to high BTU, pipeline quality gas. This particular staged concept of gasification was originated primarily to maximize the yield of methane. Considerable methane is produced as the coal is devolatilized. DOE

N82-27533# Nobel's Explosives Co. Ltd., Stevenston (England). Propellants Research and Development Section.
CODIFICATION OF HIGH TEMPERATURE PROPELLANTS TRHA
J. G. K. Higgon Paris ESA 15 Sep. 1981 28 p
(Contract ESTEC-4113/79/NL-AKW(SC))
(GR-38/80/1; ESA-CR(P)-1374-Vol-2) Avail: NTIS
HC A03/MF A01

Production of a short grain size TRHA is discussed. Firing tests on GBSe (S5) reference powder indicated that a TRHA grain length of 0.02 mm was needed to match GBSe (S5) ballistics. Since the shortest practical length of TRHA is 0.2 mm, a batch was separated into: regular grain sizes; residue after removal of well shaped grains; and fine dust obtained from the

residue. The regular grain size best reproduced the desired ballistics in GR 13/80 tests. Pilot batches of 1.8 mm dia, 0.2 mm length grains were tested as to chemical composition, density, vacuum stability, ignition temperature, mechanical sensitivity, and closed vessel ballistics. Two qualification batches burned too quickly when proofed, due to poor grain cut. Freshly sharpened blades produce a powder to specification. Author (ESA)

N82-27534# Engineering-Science, Inc., Arcadia, Calif.
ANALYSIS OF POTENTIAL METHODS TO DETERMINE VOLATILITIES OF HEAVY CRUDE OILS Final Report
Robert J. Bryan Dec. 1981 60 p refs
(Contract EPA-68-02-3509)
(PB82-145384; EPA-909/9-81-004) Avail: NTIS HC A04/MF A01 CSCL 21D

Alternative methods to measure the volatility of heavy crude oil are discussed. The work was restricted to a literature search and inquiries made to informed government and industry groups. Methods investigated include developing data to extend the temperature and vapor pressure range of the correlation nomograph, modifying the Reid vapor pressure method, use of a vapor composition approach, and determining evaporation losses under controlled conditions. Sampling and analytical problems were evaluated for the alternatives. A recommendation was made to conduct further studies on the vapor composition method. GRA

N82-27535# Water Resources Council, Washington, D.C.
SYNTHETIC FUELS DEVELOPMENT IN THE UPPER COLORADO REGION: SECTION 13(A) WATER ASSESSMENT REPORT
Jul. 1981 138 p refs
(PB82-156761) Avail: NTIS HC A07/MF A01 CSCL 13B

The following general conclusions and major specific findings were reached during the course of the water assessment for the Upper Colorado region. The production of synthetic fuels in the Upper Colorado River region by the extraction and processing of oil shale and/or coal, will require significant quantities of water. The overall supply of ground and surface water resources in the region is sufficient to accommodate a synthesis production level of nearly 3 million barrels oil equivalent per day. While the gross water supplies in the region are sufficient for accelerated synfuels development, water supply problems are apparent in some areas. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-27536# Ecosometrics, Inc., Bethesda, Md.
BENEFIT-COST ANALYSIS OF AN ENGINEERING STANDARD: THE ASTM GLASS LIQUIDUS STANDARD
Armando M. Lago and J. Matthew McEnroe 10 Mar. 1981 167 p refs
(Contract NB80-SBCA-0342)
(RR-148) Avail: NTIS HC A08/MF A01

The economic impacts of the ASTM glass liquidus standard are assessed. Impacts accruing from National Bureau of Standards resource investments are considered. N.W.

N82-27537# National Building Research Inst., Pretoria (South Africa).
REPORT ON THE SUITABILITY OF SOME METALLURGICAL SLAGS AS AGGREGATE FOR CONCRETE
A. F. G. Rossouw, J. E. Krueger, and J. vanDijk 1981 27 p
(NBRI-SP-BOU-56; ISBN-0-7988-2044-6) Avail: NTIS HC A03/MF A01

Chrome, copper, and platinum slags were evaluated as aggregrates in concrete. Eight of the slags were determined to be suitable for use as aggregates, provided they do not contain unslaked lime. The availability, characteristics, chemical and physical properties, and particle sizes of the slags are given. Mix proportions and physical and mechanical properties of fresh concretes with differing aggregate-cement ratios are presented. J.D.

N82-27538# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
A STATISTICAL EVALUATION OF SOIL AND CLIMATIC PARAMETERS AFFECTING THE CHANGE IN PAVEMENT DEFLECTION DURING THAWING OF SUBGRADES
Edwin J. Chamberlain Jul. 1981 18 p refs
(DA Proj. 4A7-62730-AT-42)
(AD-A106976; CRREL-81-15) Avail: NTIS HC A02/MF A01 CSCL 13/2

This report analyzes the results of a field study previously reported by Scrivner et al. (1969) for the National Cooperative Highway Research Program. These authors studied the seasonal pavement deflection characteristics of 24 test sites on roads in service in regions with freezing indexes ranging from 100 F-days to 2100 F-days. They used the Dynaflect cyclic pavement loading device to determine the pavement system response. Of specific interest to my analysis was the increased pavement deflection after freezing and thawing and the time to recovery of normal deflection characteristics. These characteristics were related to soil and climatic factors using statistical techniques. The most significant observations of this statistical analysis are: (1) that the freezing index is not a significant parameter in determining the percent increase in pavement deflection during thawing, and (2) that the recovery time is inversely proportional to the depth of freezing. As was expected, the most significant variable affecting the increase in pavement deflection was the frost susceptibility classification. This observation reinforces the necessity for careful selection of soil materials used in pavement systems. Author (GRA)

N82-27539# Materials Research Labs., Ascot Vale (Australia).
SLOW SPEED MACHINING OF TITANIUM
D. M. Turley Oct. 1981 35 p refs
(AD-A112176; MRL-R-833) Avail: NTIS HC A03/MF A01 CSCL 11/6

Catastrophic-shear type chips are produced in machining titanium. These are shown to be formed by a cyclic process of indentation and catastrophic shear. The deformation within the chip was very heterogeneous most of the deformation occurring in narrow shear bands between the segments. A model of chip formation has been proposed based on orthogonal planning and machining in the scanning electron microscope. Cracking was often associated with the shear bands and this degraded surface finish. The change to a continuous chip at low cutting speeds reported by Recht was not observed and furthermore, the surface finish further deteriorated. Decreasing the depth of cut, rake angle, or using tools having a large nose radius made the chip less segmented and consequently improved surface finish. The depth of deformation beneath the machined surfaces increased with increasing depth of act and decreasing rake angle. Machining with a lubricant decreased the depth of deformation. GRA

N82-27540# Philips Labs., Briarcliff Manor, New York.
CONTINUED DEVELOPMENT OF A 10 K CRYOGENIC COOLER Final Technical Report, 1 Jun. - 31 Dec. 1981
Wyatt Newman Arlington, Va. ONR Mar. 1982 36 p refs
(Contract N00014-81-C-0524)
(AD-A113660) Avail: NTIS HC A03/MF A01 CSCL 13/1

Development of the design selected for the 10 K cryogenic cooler in the Phase I study was continued in this second phase of the program. The configuration arrived at in Phase 1 was a triple-expansion, free-displacer Stirling-cycle refrigerator driven by a linear motor. Vibrations are attenuated with a passive vibration absorber. Electromagnetic noise from the motor is attenuated with layered, high permeability, magnetic shielding. The cooler can meet or better the goals for cooling and power consumption. It can provide 200 mW of cold at 10 K at the maximum allowable input of 250 W, or provide the prescribed 50 mW of cold with less than 100 W of input power. The cooler weight is 35.9 kg for the thermodynamic components, 17 kg for the vibration absorber, and 8.6 kg for the EMI shielding. The design goals for cooldown time and regulation of the cold-tip temperature can be met or bettered. The resulting EMI and vibration levels can not be accurately predicted, but they are expected to exceed the extremely low levels desired. Author (GRA)

N82-27541# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.

STRENGTH DESIGN OF REINFORCED CONCRETE HYDRAULIC STRUCTURES; REPORT 3, T-WALL DESIGN
Tony C. Liu Jan. 1982 110 p refs
(AD-A113629; WES/TR/SL-80-4-3) Avail: NTIS HC A06/MF A01 CSCL 13/13

This report covers the specific strength design criteria and strength design procedures for inverted T-walls used as retaining walls or flood walls founded on earth or rock. Among the subjects covered are: applicable loads and forces; loading combinations; base reaction; design strength for reinforcement; distribution of flexural reinforcement; control of deflections; shrinkage and temperature reinforcement; concrete cover for reinforcement; details of reinforcement; maximum tension reinforcement; minimum reinforcement flexural members; combined flexure and axial loads; factored shear force; shear strength of walls; design of structural components; and design examples. A commentary discussing the considerations and background information used in developing the strength design criteria is also included.
Author (GRA)

N82-27542# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MECHANICS OF CUTTING AND BORING. PART 7: DYNAMICS AND ENERGETICS OF AXIAL ROTATION MACHINES
Malcolm Mellor Dec. 1981 47 p refs
(DA Proj. 4A7-62730-AT-42)
(AD-A113931; CRREL-81-26) Avail: NTIS HC A03/MF A01 CSCL 13/9

This report deals with force, energy and power in machines such as drills and boring devices, where the cutting head rotates about a central axis while penetrating parallel to that axis. Starting from a consideration of the forces developed on individual cutting tools, or segments of cutters, the thrust and torque on a complete cutting head is assessed, and simple relationships between thrust and torque are derived. Similarly, the energy and power needed to drive the cutting head are estimated and related to tool characteristics. Design characteristics of existing machines are compiled and analyzed to give indications of thrust, torque, power, effective tool forces, nominal thrust pressure, power density and specific energy. Author (GRA)

N82-27543# California Univ., Davis. Dept. of Civil Engineering.
A VERIFICATION STUDY FOR THE BOUNDING SURFACE PLASTICITY MODEL FOR COHESIVE SOILS Report, Feb. 1981 - Jan. 1982
L. R. Herrmann, C. K. Shen, S. Jafroudi, J. S. DeNatale, and Y. F. Defalias Port Hueneme, Calif. Naval Civil Engineering Lab. Mar. 1982 56 p refs
(Contract N62583-81-MR-320; YF0230301)
(AD-A113673; NCEL-CR-82.013) Avail: NTIS HC A04/MF A01 CSCL 08/13

Results of drained and undrained, triaxial compression and extension, and thick-walled cylinder laboratory tests are given for a laboratory prepared kaolin soil. For the soil in question, a portion of the data is used to calibrate a 'bounding surface plasticity model' for cohesive soils. The model is used to analyze the remaining tests and the results are compared to the measured values with good agreement. Author (GRA)

N82-27544# Illinois Univ., Urbana. Dept. of Civil Engineering.
LONGITUDINAL JOINT SYSTEMS IN SLIP-FORMED RIGID PAVEMENTS. VOLUME 4: RECOMMENDATIONS FOR ALTERNATE JOINT SYSTEMS AND FOR STRENGTHENING EXISTING JOINTS Interim Report
Linda Korbus and Ernest J. Barenberg Nov. 1981 76 p refs
(AD-A112970; FAA-RD-79-4-4) Avail: NTIS HC A05/MF A01 CSCL 13/2

Load transfer across joints is a key factor in the performance of PCC pavements. The common load transfer devices in longitudinal joints for airport pavements have for many years been concrete keyways. Many of these keyways fail under heavy aircraft loads and are very difficult to construct using slip-formed pavers. Alternate joint systems which are potentially more reliable than keyways and which can be constructed using slip-formed pavers are presented in the report. Also, procedures are described for retrofitting existing slabs with devices to provide load transfer across joints or cracks. Laboratory and field tests with these load transfer devices are described, and data on their performance are presented. Recommendations for joint designs for PCC airport pavements are given based on the level of traffic anticipated. GRA

N82-27545# Ruetgerswerke A.G., Frankfurt am Main (West Germany).
SOLAR EQUIPMENT SYSTEM PACKAGES FOR OLD AND NEW BUILDINGS TO PROVIDE DOMESTIC WATER AND PARTIAL HEATING Final Report
Goesta Berg and Franz Juergen Mueller Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 87 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-029; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,30

Technically optimized and economically marketable system packages were investigated. Commercially available flat roof collectors failed long term (2 yr) tests. Architecturally, it is difficult to integrate the collectors into roof or wall surfaces due to their box design. Satisfactory integration is only achieved by including collectors in new building plans. Alternatively, a highly efficient plastic collector with long service life was developed. Although initial expenditure with conventional building construction is high, an improved cost-benefit relation is obtained, incorporating the flexible mat-shaped plastic absorber with fully wetted surface which is operated at pressure below atmospheric. Pilot plant results with a bivalent heat pump system prove collector capability. Design data for the absorber circuit and heat pump system are given. Author (ESA)

N82-27546# Portland Cement Association, Skokie, Ill. Construction Technology Labs.
RAPID DETERMINATION OF THE CHLORIDE PERMEABILITY OF CONCRETE Final Report
D. Whiting Aug. 1981 176 p refs
(Contract DOT-FH-11-9305)
(PB82-140724; FHWA/RD-81/119; CR-2056) Avail: NTIS HC A09/MF A01 CSCL 13B

Techniques were developed for determination of the permeability of a variety of concretes to chloride ions in a relatively rapid period of time. The most promising method involves application of d.c. voltage in the range of 60.0-80.0 volts for 6-hours to either a section of a reinforced concrete bridge deck or a core taken from a concrete structure. Both variations involve conditioning of the specimen prior to test so as to eliminate test anomalies caused by low sample moisture contents. Core specimens can be tested at the rate of one specimen per day with a total of 2 days needed for a complete test including conditioning. The field apparatus is capable of conducting four tests within one working week on a given bridge deck. Results yield reasonably good correlation with FHWA 90-day ponding data on companion specimens. Concretes can be ranked according to high, moderate, low, or very low chloride permeability. GRA

N82-27547# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ANALYSIS AND MODELING OF CORROSION OF STEEL IN PRESTRESSED CONCRETE
Nov. 1981 25 p refs Sponsored in part by the Dept. of State
(PB82-141771; NBSIR-81-2390) Avail: NTIS HC A02/MF A01 CSCL 13C

The application of the principles of stress corrosion and general corrosion to understanding the mechanisms involved in corrosion of steel in prestressed concrete is discussed. The first step in estimating the failure time of a prestressed concrete structural system because of corrosion of the reinforced steel is to estimate corrosion rates under various but realistic conditions. A simplified approach based on mathematical modeling of concrete properties for estimating corrosion rates is proposed. Before the proposed mathematical model can be applied to practical problems information is needed on the specific mechanisms of corrosion cell processes of steel in prestressed concrete. In addition, well designed corrosion tests need to be performed in

which all the important factors affecting the corrosion rates are considered. GRA

N82-27548# National Bureau of Standards, Washington, D.C.
HURRICANE-INDUCED WIND LOADS
Martin E. Batts and Emil Simiu Aug. 1981 23 p refs
(Grant NSF CEE-80-25718)
(PB82-132267; NBS-DF-81/005A) Avail: NTIS HC A02/MF A01 CSCL 13M

A computer program was developed that uses as input the aerodynamic coefficients corresponding to eight or sixteen compass directions and produces as output wind loads on cladding or structural members corresponding to various mean recurrence intervals. GRA

N82-27549# Transport and Road Research Lab., Crowthorne (England).
MONITORING OF WEATHERING STEEL STRUCTURES. THE INDUCTION ULTRASONIC THICKNESS TESTERS
M. McKenzie 1981 19 p refs
(PB82-135807; TRRL-SUPPLEMENTARY-677; ISSN-0305-1315) Copyright. Avail: NTIS HC A02/MF A01 CSCL 13M

Long term corrosion tests carried out in the UK show that weathering steels continue to corrode at a finite rate. It is therefore necessary to use thicker steel and to monitor the corrosion. An ultrasonic instrument to measure residual steel thickness was assessed. This measures steel thickness through a rust layer, requires no couplant to transmit the ultrasound into the steel and gives only the steel thickness not the thickness of the steel plus a layer of rust. This instrument provides a suitable method of measuring the residual steel thickness on weathering steel structures where corrosion has been generally uniform. However, the instrument can give no information on localized roughness or pitting of the underlying steel surface and it would seem worthwhile to include test specimens in any monitoring scheme so that the surface condition of the steel can be assessed. GRA

N82-27550# Portland Cement Association, Skokie, Ill.
GALVANIC CATHODIC PROTECTION FOR REINFORCED CONCRETE BRIDGE DECKS: FIELD EVALUATION Final Report
D. Whiting and D. Stark Jun. 1981 75 p refs Sponsored in part by Federal Highway Administration, and American Association of State Highway and Transportation Officials
(PB82-152877; TRB/NCHRP/REP-234; ISBN-0-309-03159-1; ISSN-007-5614; LC-81-52128) Avail: NTIS HC A04/MF A01 CSCL 13B

The application of four sacrificial zinc anode cathodic protection systems to a reinforced concrete highway bridge deck is described. Two system designs were found to be the most promising in terms of polarized potentials and protective current densities achieved during the 3 year monitoring program. One design uses commercially available zinc ribbon anodes spaced at 5 in (127 mm) centers; the other, custom-fabricated perforated zinc sheets. Both systems are overlaid with an open-graded asphalt friction course. The systems yield maximum current density and polarized potentials under warm and moist environment conditions. GRA

N82-27551# Enviro-Management and Research, Inc., Washington, D. C.
SOLDERING AND BRAZING SAFETY GUIDE: A HANDBOOK ON SPACE PRACTICE FOR THOSE INVOLVED IN SOLDERING AND BRAZING
1981 89 p
(Contract PHS-HSM-99-73-33)
(PB82-151721) Avail: NTIS HC A05/MF A01 CSCL 13L

This manual provides those involved in welding and brazing with effective safety procedures for use in performance of their jobs. Hazards exist in four types of general soldering and brazing processes: (1) cleaning; (2) application of flux; (3) application of heat and filler metal; and (4) residue cleaning. Most hazards during those operations can be avoided by using care, proper ventilation, protective clothing and equipment. Specific process hazards for various methods of brazing and soldering are treated. Methods to check ventilation are presented as well as a check of personal hygiene and good maintenance practices are stressed. Several emergency first aid treatments are described. GRA

N82-27552# Transportation Systems Center, Cambridge, Mass.
IMPROVEMENTS IN TRANSPORTATION FIRE SAFETY DATA BASES Final Report, Oct. 1980 - Mar. 1981
William T. Hathaway Dec. 1981 28 p refs
(PB82-142043; DOT-TSC-OST-81-7) Avail: NTIS HC A03/MF A01 CSCL 13L

The existing statistical data bases for transportation system accidents were designed primarily to fulfill the modal administrative reporting functions. As such, the data collected are of a very broad nature and of limited use in the identification of areas of possible research and in the development and measurement of the effectiveness of regulatory action. The design objectives which fire safety data bases should address are identified, and recommendations for improvements in transportation fire safety data bases provided. A review of the available data bases containing information of transportation fires is presented. GRA

N82-27553# Case Inst. of Tech., Cleveland, Ohio. Dept. of Civil Engineering
REDUCTION OF OVERTURNING POTENTIAL OF SEISMICALLY EXCITED STRUCTURES Final Report
Arthur A. Huckelbridge, Jr., Robert M. Ferencz, and Shya-Ling Shein May 1981 187 p refs
(Grant NSF PFR-78-08013)
(PB82-158494; NSF/CEE-81076) Avail: NTIS HC A09/MF A01 CSCL 13M

The effects of large overturning moments on the seismic response of structures were investigated. In particular, the influence of allowing transient foundation uplift was examined, and more efficient computations methods to treat such localized nonlinearity were incorporated into an existing general analysis program. A variety of commonly used structural types and configurations were studied, including moment frames, braced frames, shear walls, and framed tubes. For the structures examined, transient foundation uplift was found extremely effective in limiting response parameters governed by, or related to, overturning effects. For structures which maintained reasonable levels of ductility demand within the superstructure there was little or no apparent loss in drift control associated with transient uplift. Response parameters not arising from overturning were not mitigated by transient foundation uplift. It was shown that story shears may be attributable to a significant degree to second or even higher mode response. The use of substructuring techniques was shown to be computationally attractive for treating localized nonlinearity such as transient foundation uplift. GRA

N82-27554# Construction Technology Labs., Skokie, Ill.
EARTHQUAKE RESISTANT STRUCTURAL WALLS ANALYSIS OF COUPLED WALL SPECIMENS Final Report
T. Takayanagi, A. Scanlon, and W. G. Corley Jul. 1981 117 p refs
(Grant NSF ENV-77-15333)
(PB82-149048; NSF/CEE-81067) Avail: NTIS HC A06/MF A01 CSCL 13M

A structural model that can predict the response history and failure mechanisms of coupled wall systems under static loads is described. The analytical results are compared with test results for coupled wall specimens tested at the Construction Technology Laboratories. On the basis of this comparison, effects of assumed analytical conditions of overall behavior are discussed. The analytical results are in agreement with the experimental results with respect to overall behavior of the wall systems considered. It was demonstrated that analytical models can simulate important aspects of behavior of constituent members of coupled wall systems. GRA

N82-27555# National Bureau of Standards, Washington, D.C.
CALCULATION OF INTER-ROOM AIR MOVEMENT FOR MULTI-ROOM BUILDING ENERGY ANALYSIS
George N. Walton Nov. 1981 37 p Sponsored in part by DOE
(PB82-142209; NBSIR-81-2404) Avail: NTIS HC A03/MF A01 CSCL 13M

A model is presented for computing the infiltration and air flow between rooms of a multi-room building in terms of basic principles of fluid mechanics. This model has been incorporated into a comprehensive loads predicting computer program. Air flows, room temperatures, and heating loads for a typical

townhouse under different conditions of environment and with various construction features are computed. These calculations show the feasibility of detailed multi-room air movement analysis. They also indicate that when the inter-room openings of a low-rise structure are large compared to the envelope openings, the infiltration and total load can be accurately, and more quickly, computed by assuming no resistance to air flow between rooms. This property will also allow simplified calculations for high-rise buildings with many rooms. Methods are proposed for handling more complex air flow phenomena. Author (GRA)

N82-27556# National Bureau of Standards, Washington, D.C. Center for Fire Research.
AN ASSESSMENT OF THREE DIFFERENT FIRE RESISTANCE TESTS FOR HYDRAULIC FLUIDS Final Report
Joseph J. Loftus Oct. 1981 54 p Sponsored in part by the US Bureau of Mines, and Mine Safety and Health Administration
(PB82-142217; NBSIR-81-2395) Avail: NTIS HC A04/MF A01 CSCL 08I

The Center for Fire Research at the National Bureau of Standards at the request of the Mine Safety and Health Administration (MSHA) and the Bureau of Mines made an evaluation or assessment of the three different flammability tests used by MSHA for measuring the fire resistance of hydraulic fluids intended for use in underground coal mining operations. The methods described in the Code of Federal Regulations Schedule 30, Part 35, consist of the following: an Autogenous Ignition Temperature Test, a Temperature-Pressure Spray Ignition Test, and a Test to Determine the Effect of Evaporation on the Flammability of Hydraulic Fluids. Recommendations for improvement of the three test procedures are provided. GRA

N82-27557# National Academy of Engineering, Washington, D. C.
EDUCATIONAL TECHNOLOGY IN ENGINEERING
Lionel V. Baldwin and Kenneth S. Down 1981 133 p refs
(PB82-149287; ISBN-0-309-03138-9; LC-81-80333) Avail: NTIS HC A07/MF A01 CSCL 05I

The literature and current knowledge on the use of modern technological methods in engineering education is reviewed, with an emphasis on videotape systems. The primary focus is on current practices. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-27558* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPIRAL SLOTTED PHASED ANTENNA ARRAY Patent
Haynes Ellis, Jr., inventor (to NASA) (Rockwell International Corp., Downey, Calif.) Issued 9 Feb. 1982 7 p Filed 25 Jul. 1980 Supersedes N80-29543 (18 - 20, p 2685) Sponsored by NASA
(NASA-Case-MSC-18532-1; US-Patent-4,315,266; US-Patent-Appl-SN-172099; US-Patent-Class-343-895; US-Patent-Class-343-789) Avail: US Patent and Trademark Office CSCL 20N

A flush mounting, cavity-backed, dual orthogonal slot antenna for aircraft and space vehicles is described. Improved radiation pattern characteristics are obtained by making the spiral slot pattern elliptical in the aperture plane. A cavity and a flanged aperture plate are configured such that one slot pair is orthogonal with respect to another slot pair within the aperture plate. Coaxial split-tube baluns are used to drive the junctions between corresponding slot pairs. An optional cavity dielectric is provided and a drive coupling arrangement includes a four port comparator hybrid having sum and difference ports respectively, for alternate excitation to produce a single lobe or a double lobe pattern with null. Switching apparatus is provided to connect a common terminal to either of the ports.
Official Gazette of the U.S. Patent and Trademark Office

N82-27559 Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Groupe Essais.
EXPOSURE OF STRUCTURES ON THE GROUND TO AN ELECTROMAGNETIC FIELD PULSE EMITTED BY A RECTANGULAR HORN SIMULATOR [ILLUMINATION DE STRUCTURES AU SOL PAR UNE IMPULSION DE CHAMP ELECTROMAGNETIQUE AU MOYEN D'UN SIMULATEUR DE TYPE CORNET]
C. Rodiere and M. Crochet 1981 6 p In FRENCH Presented at Coll. sur la Compatabilite Electromagnetique, Lille, Jan. 1981 (SNIAS-821-422-112) Avail: NTIS HC A02

The possibility of exposing a ground surface of several hundred square meters to an electromagnetic impulse plane wave front is analyzed. When evaluating the electromagnetic hardness of a system, the individual components are often studied, then the results are collected into a comprehensive model. Coupling effects can be overlooked. An electromagnetic field simulator, formed by two conductive sheets whose axis is vertical or oblique, is proposed. The test method determines on a macroscopic scale mean values for permittivity and conductivity parameters of the exposed surface. Author (ESA)

N82-27560# SRI International Corp., Menlo Park, Calif.
STIP 7: FOUR NEIGHBORING RADIO PATHS TRAVERSE THE NORTHERN CORONA IN 1979 Final Scientific Report, May 1979 - Sep. 1981
Thomas A. Croft Dec. 1981 80 p refs
(AF Proj. 2311)
(AD-A113083; AFGL-TR-82-0035) Avail: NTIS HC A05/MF A01 CSCL 03/2

In August and September, 1979, a unique parade of spacecraft could be observed. With reference to the ecliptic plane, Pioneer Saturn, Voyager 1 and Voyager 2 appeared to move from left to right, about one degree north of the Sun, while Pioneer Venus traversed the same path from right to left. Because the influence of the Sun on radio signals is concentrated in the region nearest the Sun, we are able to use the radio signals from these four spacecraft as probes of the solar corona. The spacecraft parade offered two types of opportunities that are closely related: first, those due to the multiple observations in the same region of the corona, and second, the three opportunities when pairs among the four spacecraft passed close to one another in the sky. Because Pioneer Venus traveled eastward relative to the Sun while the others traveled westward, it follows that Pioneer Venus made a close approach to each of the other three. The value of data emerging from these interplanetary recording sessions is enhanced because the events occur in the midst of STIP Interval VII during which the northern and equatorial corona were monitored by many diverse techniques. The gathering of four spacecraft behind the northern corona serves as a means for tracking the macroscopic flow patterns in the corona and relating the patterns to scintillations white-light coronagraphs, high-energy particle distributions, radio noise bursts, spectroheliograms, magnetograms, radio-star scintillations, and the like. GRA

N82-27561# Auburn Univ., Ala. Engineering Experiment Station.
AUTOMATIC HANDOFF OF MULTIPLE TARGETS Final Technial Report, 10 Oct. 1980 - 14 Sep. 1981
J. S. Boland, III, H. S. Ranganath, and D. V. Satish Chandra Redstone Arsenal, Ala. Army Missile Command 14 Sep. 1981 166 p refs
(Contract DAAH01-80-C-0258)
(AD-A107490; AD-E950176; DRSMI/RG-CR-81-4) Avail: NTIS HC A08/MF A01 CSCL 17/5

In order to fully utilize the potential of the 'fire and forget' class of helicopter-borne missiles, it is necessary to solve the technical problems associated with acquiring and handing off multiple targets from a precision pointing and tracking system (PTS) to several missile seekers simultaneously or almost so in a short period of time. The multiple target problem is that of locating targets and missile seeker aim points within the PTS field of view, deciding which target is to be assigned to each missile, generating error signals to the torquers in order to slew the missile LOS such that its assigned target is in the center of

its FOV, and initiating automatic seeker tracking. The task of locating a given smaller image within a larger image is known as 'image registration'. A detailed comparison of the important multiple image registration methods based on the number of arithmetic operations for software implementation and the complexity of hardware for real time implementation is presented. New methods of accomplishing multiple image registration which are computationally more efficient than the most commonly used template matching techniques (correlation and sequential similarity detection algorithm) are described. Several methods are compared with respect to hardware requirements and speed of computation. Author (GRA)

N82-27562# Brown Univ., Providence, R. I. Center of Dynamical Systems.

APPROXIMATION OF PROCESSES AND APPLICATIONS TO CONTROL AND COMMUNICATION THEORY

Harold J. Kushner Jun. 1981 32 p refs

(Contract N00014-76-C-0279; Grants AF-AFOSR-3063-76; NSF ENG-77-12946)

(AD-A107520; LCDS-81-18) Avail: NTIS HC A03/MF A01 CSCL 12/2

Diffusion models are useful and of widespread use in many areas of control and communication theory. The models are frequently used for systems that are not quite diffusions but are, hopefully, close to a diffusion in some sense, e.g., the input noise might be wide band but not white Gaussian. Many approximation techniques have been developed, under different sets of assumptions. The typical results are of a weak convergence nature. The physical process (x (to the epsilon power) (.)) is parameterized by the parameter epsilon, and one tries to show that (x (to the epsilon power) (.)) converges weakly to some diffusion x(.) as epsilon goes to 0. The limit process x(.) is then used to study various properties of x (to the epsilon power) (.) for small epsilon. GRA

N82-27563# Polytechnic Inst. of New York, Farmingdale.

A NETWORK SOLUTION OF THE 1-DIMENSIONAL INVERSE PROBLEM BY TIME-DOMAIN REFLECTOMETRY, PART 1

D. C. Youla and G. Gnavi Griffiss AFB, N.Y. RADC Jan. 1982 35 p refs

(Contract F30602-78-C-0048; AF Proj. 0172)

(AD-A112629; RADC-TR-81-381) Avail: NTIS HC A03/MF A01 CSCL 12/1

This Part 1 of a projected 2-part study initiates an indepth network study of the inverse problem for 1-dimensional passive, lossless smooth dispersive nonuniform structures. The diagnostic procedure is via time-domain pulse-reflectometry and rests on a new continuous-discrete inversion formula. It is expected that this formula, when used together with the weak convergence principle described in Section V, will lead to a well-posed solution involving a coupled pair of Fredholm integral equations of the second kind. Author (GRA)

N82-27564# California Univ., Los Angeles. Integrated Electromagnetics Lab.

MICROSTRIP DIPOLES ON CYLINDRICAL STRUCTURES

N. G. Alexopoulos, P. L. E. Uslenghi (Illinois Univ., Chicago Circle), and N. K. Uzunoglu (National Technical Univ., Athens) Dec. 1981 23 p refs

(Contract DAAG29-79-C-0050)

(AD-A112616; UCLA-Eng-82-14; UCLA-5; ARO-15965.12-EL) Avail: NTIS HC A02/MF A01 CSCL 20/14

An electric dipole tangent to the outer surface of a dielectric layer which coats a metallic cylinder is considered. Exact expressions are obtained for the electromagnetic field produced by the dipole, both inside the coating layer and in the surrounding free space. Asymptotic results are derived for a cylinder whose diameter is large compared to the wavelength. Arrays of elementary dipoles are discussed. Author (GRA)

N82-27565# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.

BEAT EXCITATION OF WHISTLER WAVES

M. Shoucri, G. J. Morales, and J. E. Maggs Jan. 1982 26 p refs

(Contract N00014-75-C-0476)

(AD-A112598; PPG-609) Avail: NTIS HC A03/MF A01 CSCL 20/14

This report provides a clear example of how the nonlinear efficiency for the radiation of a low frequency electromagnetic signal due to the beat of two high frequency pumps can be determined from first principles. The calculation includes plasma nonuniformity as well as finite spatial extent of the pumps. The figure of merit for the beat process is given by the compact expression. A rough order of magnitude evaluation of this expression shows a radiated power whose dependence on pump power scales as P sub R is equivalent to V sub os squared P sub p, where V sub S refers to the oscillating velocity of an electron due to the high frequency pump, and c is the speed of light. This dependence illustrates readily the extreme inefficiency of the process at low pump power (i.e., v sub os). Another fundamental factor which lowers the efficiency is that the coupling to the whistler wave occurs through electric dipole excitation. A more efficient excitation mechanism would be to use magnetic coupling, i.e., to generate a nonlinear transverse current oscillating at the beat frequency. However, within the constraints of the present geometry this more desireable situation cannot be realized directly. The most advantageous feature of the beat excitation described here is the controllability of the spatial location from which the whistler emanates. GRA

N82-27566# California Univ., Los Angeles. Integrated Electromagnetic Lab.

MUTUAL COUPLING FROM FAR FIELD MEASUREMENTS

S. Chaiken, G. Franceschetti, and N. G. Alexopoulos Dec. 1981 50 p refs

(Contract DAAG29-79-C-0050)

(AD-A112814; UCLA-Eng-81-44; UCLA-4; ARO-15965.11-EL) Avail: NTIS HC A03/MF A01 CSCL 20/14

A theory for mutual coupling between two dimensional canonical minimum scattering antenna is reviewed. Expressions for self and mutual impedance are formulated in terms of the measurable far field radiation diagram. The case of two identical aerials is considered in some detail. The constraint of band limitation is applied to the antenna pattern function to facilitate the required analytic continuation thereof. Numerical analytic continuation is addressed whereby sampling proximates and Miller-Tikhonov regularization schemes are examined.

Author (GRA)

N82-27567# Lincoln Lab., Mass. Inst. of Tech., Lexington. Div. 6.

TECHNOLOGY ASSESSMENT: OPTICAL COMMUNICATIONS, SIGNAL PROCESSORS, AND RADIATION EFFECTS

Leon J. Ricardi, ed., Don M. Boroson, Vincent W. S. Chan, B. H. Hutchinson, Frederick G. Walther, John P. Woods, and Stephen L. Zolnay 7 Jan. 1982 95 p refs

(Contract F19628-80-C-0002; AF Proj. 2029; AF Proj. 6430) (AD-A112523; ESD-TR-81-333) Avail: NTIS HC A05/MF A01 CSCL 22/2

Military satellite communication system architects are often constrained by the performance capability of technology limited devices. Consequently, it is important to continually assess that technology essential to the support of future MILSATCOM systems. This project report and those published previously summarize study efforts that developed strawman MILSATCOM systems which satisfy projected user requirements. The technology requisite to deployment of these SATCOM systems was carefully evaluated, and required improvements were described and/or defined. Previously, the study was limited to RF devices or related phenomena. This report considers optical communications systems, on-board signal demodulators, and radiation effects. An update on the traveling-wave tube technology is presented because of its extreme importance to the development of affordable MILSATCOM terminals. Author (GRA)

N82-27568# Lincoln Lab., Mass. Inst. of Tech., Lexington.

NETWORK SPEECH SYSTEMS TECHNOLOGY PROGRAM Annual Report, 1 Oct. 1980 - 30 Sep. 1981

Clifford J. Weinstein 30 Sep. 1981 78 p refs

(Contract F19628-80-C-0002)

(AD-A112718; ESD-TR-81-336) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report documents work performed during FY 1981 on the DCA-sponsored Network Speech Systems Technology Program. The two areas of work reported are: (1) communication system studies in support of the evolving Defense Switched Network (DSN) and (2) design and implementation of satellite/terrestrial interfaces for the Experimental Integrated Switched Network (EISN). The system studies focus on the development and evaluation of economical and endurable network routing procedures. Satellite/terrestrial interface development includes circuit-switched and packet-switched connections to the experimental wideband satellite network. Efforts in planning and coordination of EISN experiments are reported in detail in a separate EISN Experiment Plan. Author (GRA)

N82-27569# Aeronautical Research Associates of Princeton, Inc., N. J.

ATMOSPHERIC FLUCTUATIONS WHICH LEAD TO TRACKABLE RADAR SIGNALS IN THE MARINE BOUNDARY LAYER Final Report, 1 Aug. 1980 - 31 Jul. 1981

W. S. Lewellen, H. Segur, R. I. Sykes, and C. P. Cerasoli Jul. 1981 128 p refs
(Contract N00014-80-C-0873)
(AD-A107523; ARAP-450) Avail: NTIS HC A07/MF A01 CSCL 20/14

A description and rough cataloguing of the dominant types of fluid dynamic features which may be expected to yield trackable radar targets in the atmospheric boundary layer is provided. Conditions favorable for target motion relative to the ambient wind velocity are discussed. One particularly interesting type of wave generated target is that involving Kelvin-Helmholtz wave breaking which occurs when a wave of sufficient amplitude passes through a slightly stable fluid shear layer. This type of wave breaking is examined numerically using A.R.A.P.'s second-order closure turbulence model. This normalized computation allows the evolution of the radar pattern for this particular type of event to be interpreted in terms of the temperature, humidity, and velocity across a particular shear zone, and the wave speed of the triggering internal wave. GRA

N82-27570# Atlantic Research Corp., Rome, N.Y.

SPACE-BASED RADAR ARRAY SYSTEM SIMULATION AND VALIDATION Final Technical Report, 7 Mar. 1979 - 7 Mar. 1981

Harvey K. Schuman, Donald R. Pflug, and Larry D. Thompson Griffiss AFB, N. Y. RADC Aug. 1981 101 p refs
(Contract F30602-79-C-0116; AF Proj. 4506)
(AD-A106996; RADC-TR-81-215) Avail: NTIS HC A06/MF A01 CSCL 17/9

The present status of the space-based radar phased array lens simulator is discussed. Huge arrays of thin wire radiating elements on either side of a ground screen are modeled by the simulator. Also modeled are amplitude and phase adjust modules connecting radiating elements between arrays, feedline to radiator mismatch, and lens warping. A successive approximation method is employed. The first approximation is based on a plane wave expansion (infinite array) moment method especially suited to large array analysis. the first approximation results then facilitate higher approximation computations that account for effects of nonuniform periodicities (lens edge, lens section interfaces, failed modules, etc.). The programming to date is discussed via flow diagrams. An improved theory is presented in a consolidated development. The use of the simulator is illustrated by computing active impedances and radiating element current distributions for infinite planar arrays of straight and 'swept back' dipoles (arms inclined with respect to the array plane) with feedline scattering taken into account. Author (GRA)

N82-27571# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ANTENNA (SELECTED ARTICLES)

D. M. Truskanov, A. A. Pistolkors, G. D. Malushkov, and A. L. Ayzenberg 19 Oct. 1981 97 p refs Transl. into ENGLISH from Antenny (USSR), no. 2, 1967 p 4-32, 55-70, 117-130, 166-178
(AD-A107321; FTD-ID(RS)T-0937-81) Avail: NTIS HC A05/MF A01 CSCL 09/5

The development of domestic technology for television transmitting antennas, hologram discrimination and antenna theory, radiation of an antenna in the form of a ribbed shaft of finite length, and the possibilities of phase correction on the small reflection in a two reflector antenna are discussed. J.D.

N82-27572# LinCom Corp., Pasadena, Calif.

PHASE NOISE STUDY, ATTACHMENT 2

R. A. Maag and F. Davarian Oct. 1981 120 p refs
(Contract N00014-81-C-2338)
(AD-A112669; TR-1082-0881) Avail: NTIS HC A06/MF A01 CSCL 17/2

LinCom has investigated the phase noise requirements of a tracking system receiver when N data links occupy a contiguous system bandwidth and are used to, in addition to transferring data, obtain time transfer between (N/2) platforms. The basic concept of time transfer was investigated under N00014-82-C-2035. In this research effort, the total system phase noise to achieve the required tracking accuracy was investigated. GRA

N82-27573# Federal Aviation Administration, Atlantic City, N.J. Technical Center.

SOFTWARE FUNCTIONAL DESCRIPTION OF MASS WEATHER DISSEMINATION SYSTEM EXPLORATORY ENGINEERING MODEL Final Report

Louis Delemarre Feb. 1982 52 p
(FAA Proj. 131-401-835)
(AD-A112706; DOT/FAA/CT-81/33; FAA-RD-82-1) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report describes the Mass Weather Dissemination System Exploratory Engineering Model software currently being evaluated in the Flight Service Station Engineering Laboratory. The object of this effort is to investigate, through development, test and evaluation, the application of digital technology to the dissemination of meteorological and aeronautical information. The prototype model is a fully-automated system designed to transfer a significant amount of workload from the flight service station specialist to system hardware/software in order to provide better service to the flying public. Author (GRA)

N82-27574# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

NARROW-BAND WIDE FIELD-OF-VIEW FILTER STUDY Final Report, 7 Jul. 1980 - 30 Oct. 1981

W. J. Gunning Mar. 1982 88 p refs
(Contract N00014-80-C-0785; DARPA Order 3650)
(AD-A112803; SC5269.1FR) Avail: NTIS HC A05/MF A01 CSCL 17/2

A material modification of traditional birefringence interference filters, having large dispersion in birefringence near an isotropic point, results in compact, narrowband filters having a dramatically increased field of view. The development of a dispersive birefringence filter was pursued both theoretically and experimentally. The effects of sheet polarizers and conventional waveplates under these conditions were studied. The developments in dispersive birefringence filters represent a major jump in the capabilities of narrowband spectral filters. Literature surveys and subsequent laboratory studies led to the identification of potential disperive birefringence materials which extend the spectral range of operation to both shorter and longer wavelengths. GRA

N82-27575# Rome Air Development Center, Griffiss AFB, N.Y.

MILLIMETER WAVE SCATTER AND ATTENUATION MEASUREMENTS ON SNOW SLABS

Uve H. W. Lammers, Dallas T. Hayes, and Richard A. Marr Sep. 1981 96 p refs
(AF Proj. 2305)
(AD-A112595; RADC-TR-81-88) Avail: NTIS HC A05/MF A01 CSCL 20/14

During the winter of 1977/78 RADC conducted a measurement program on the backscatter, bistatic scatter, and attenuation properties of metamorphic snow at millimeter wavelengths. After going through an aging process, snow cover on the ground develops sufficient internal strength so that slabs can be cut from it and removed for measurement. Low-power CW equipment was designed and constructed to conduct scatter and attenuation measurements on snow slabs at frequencies of 35, 98, and 140 GHz at vertical, horizontal and crossed polarizations. GRA

N82-27576# Rome Air Development Center, Griffiss AFB, N.Y. Antennas and RF Components Branch.

PHASED ARRAY THEORY AND TECHNOLOGY

Robert J. Mailloux Jul. 1981 124 p refs
(AF Proj. 4600)
(AD-A112697; RADC-TR-81-227) Avail: NTIS HC A06/MF A01 CSCL 09/5

The paper presents a tutorial review of theoretical developments emphasizing techniques appropriate to finite arrays, but indicating parallel developments in infinite array theory, which has become the most useful tool for analysis of large arrays. A brief review of the theory of ideal arrays is followed by a generalized formulation of array theory including mutual coupling effects, and is appropriate to finite or infinite arrays of arbitrary wire elements or apertures in the presence of a conducting ground screen. Some results of array tolerance theory are summarized from the literature and retained as reference throughout discussions of array component requirements and device tolerance for low sidelobe arrays. Examples from present technology include conformal and hemispherical coverage arrays, lightweight printed circuit arrays, systems for use with reflectors and lenses in limited sector coverage applications, and wide band array techniques. GRA

N82-27577# Rome Air Development Center, Griffiss AFB, N.Y. EM Technical Branch.

SECTOR SIDELOBE NULLING

Robert A. Shore and Ronald L. Fente Nov. 1981 27 p refs
(AF Proj. 2305)
(AD-A112628; RADC-TR-81-326) Avail: NTIS HC A03/MF A01 CSCL 20/14

The growing interest in adaptive antennas makes it worthwhile to examine the theoretical limits to what can be achieved with reduction of sidelobe levels of array antenna patterns. In this paper we address the problem of determining the minimum possible power that can be present in a specified sidelobe region subject to certain constraints. We consider three different forms of the minimization problem: (1) minimize the ratio of the power in the sidelobe region to the power in the mainbeam region; (2) minimize the ratio of the power in the sidelobe region to the power density in the mainbeam direction; and (3) minimize the power in the specified sidelobe region subject to the constraint that the array response in the mainbeam direction is held constant. It is shown that forms 2 and 3 of the minimization problem lead to identical results, and that the results obtained with form 1 are numerically close to those obtained with forms 2 and 3. GRA

N82-27578# National Telecommunications and Information Administration, Boulder, Colo.

A HIGH-FREQUENCY BROADBAND TRANSMITTER FOR MONOSTATIC SYSTEMS

Donald H. Layton Jul. 1981 91 p
(AD-A107088; NTIA-TM-81-59) Avail: NTIS HC A05/MF A01 CSCL 17/9

This report describes the design and fabrication of the broadband amplifier for the San Watch Radar on San Clemente Island. The amplifier is capable of 1400 watts peak output with a maximum duty cycle of 33%. Twenty-seven units were built with a typical amplitude deviation of 0.2 dB. Receiver preamplifiers are included in each unit to provide 8 dB of gain to overcome cable and phasing system losses. Each unit is self-cooling and sealed from the salty atmosphere. Author (GRA)

N82-27579# Naval Ocean Systems Center, San Diego, Calif. Commmunications Research and Technology Div.

EHF MULTIPLE BEAM ANTENNAS Final Report, Nov. 1979 - Oct. 1981

R. W. Major and J. M. Devan 21 Sep. 1981 57 p refs
(ZF6622001)
(AD-A112209; NOSC/TR-730) Avail: NTIS HC A04/MF A01 CSCL 17/4

The objective of this task was to design, build, and test a multiple-beam, ehf, satellite antenna system for reception of shipboard SATCOM transmissions. The system was to provide full earth coverage with multiple spot beams. The spot beams serve to enhance gain to signals in a given sector while decreasing gain to jammers not in that sector. The chosen design was a system employing a waveguide lens and 37 feed horns. Computer simulation of a lens design indicated that the system could provide 37 simultaneous beams with a minimum gain of 27 dB over the earth, at least 40.0% efficiency, and sidelobes 20 dB down. A waveguide lens, feed horns, a mixer, and an IF amplifier were fabricated or purchased. The system provided a minimum gain of 27.4 dB, the largest sidelobe was 19.8 dB down, and efficiency ranged from 41.6 to 43.5%. GRA

N82-27580# Naval Ocean Systems Center, San Diego, Calif. EM Propagation Div.

ACCURACY OF HIGH FREQUENCY MAXIMUM USABLE FREQUENCIES (MUF) PREDICTION Final Report, Sep. 1979 - Jan. 1981

D. B. Sailors, W. K. Moision, and R. P. Brown 15 Sep. 1981 132 p refs
(ZF59551002)
(AD-A107097; NOSC/TR-695) Avail: NTIS HC A07/MF A01 CSCL 20/14

The residuals between observed oblique sounder medium maximum observed frequencies (MOF) and predicted maximum usable frequencies (MUF) were used to assess the accuracy of high frequency MUF prediction. 4668 MOF's measured on 25 paths were compared against the predicted values from ITSA-1, HFMUFES 4 and MINIMUF-3.5. The data was screened into subsets to see the effect of particular paths, path length and orientation, season, month, latitude, sunspot number, diurnal trends, geographic region and sounder type. MINIMUF-3.5 was most accurate, having a bias of 0.08 MHz (0.6 percent) and a root mean square (rms) error of 3.71 MHz (3.6 percent). It was least accurate during the sunrise and sunset transition hours and for path lengths 5000 to 7000 km. Linear regression analysis identified the probable source of this error to be in the M factor calculation. Except for land paths the performance of HFMUFES 4 was disappointing. It was least accurate for paths over the ocean and with lengths between 4000 and 5000 km. Linear regression analysis identified the source of this error to be a bias in the foF2 numerical coefficient map over ocean areas. The 'k sec Phi' factor accentuated this bias as the range increased. The version of ITSA-1 with ionospheric characteristics mapped in universal time appeared to be slightly more accurate than the one with its characteristics mapped in local time. All of the programs had difficulty predicting MUFs accurately at high latitude. Author (GRA)

N82-27581# Naval Ocean Systems Center, San Diego, Calif. EM Propagation Div.

A PROGRAM TO COMPUTE ELF/VLF EARTH-IONOSPHERE MODAL HEIGHT GAINS VIA WKB METHODS UP TO SATELLITE ALTITUDES Interim Report, Feb. - Sep. 1981

R. A. Pappert and L. R. Hitney Sep. 1981 116 p refs
(AD-A107517; NOSC/TR-724) Avail: NTIS HC A06/MF A01 CSCL 20/14

This report presents a variation of an earlier program for computing Earth-ionosphere waveguide modal height gains. In particular, WKB formalism developed by Budden is used to speed up calculation of height gains in the ionosphere up to satellite altitudes. All quantities needed to calculate mode sums at those altitudes for all field components produced by subionospheric electric dipole sources can be generated with the present program. Author (GRA)

N82-27582# Naval Postgraduate School, Monterey, Calif. Dept. of Electrical Engineering.

TIME DOMAIN RADAR LABORATORY OPERATING SYSTEM DEVELOPMENT AND TRANSIENT EM ANALYSIS M.S. Thesis

Ludwig A. Sorrentino Sep. 1981 299 p refs
(AD-A112295) Avail: NTIS HC A13/MF A01 CSCL 17/9

An operator-microprocessor interactive Operating System has been developed for the Time Domain Radar Laboratory (TDRL). The Operating System performs signal acquisition and averaging, real time and frequency domain computations and provides outputs in easily evaluated graphic displays. Target classification is made by analysis of either impulse, step or ramp responses. A noise-reduction signal optimization technique is implemented. Numerous measurements of known and unknown targets are made using various antennas and results are compared to theory.

Targets are classified. Antenna parameters are established. Algorithms using the specialized features of the host Graphic System are tailored to the requirements of the TDRL for a detailed graphic presentation of processed data. Author (GRA)

N82-27583# Naval Research Lab., Washington, D. C. Ionospheric Effects Branch.

A SUMMARY OF PROPAGATION STUDIES UNDERTAKEN BY THE 1981 EXPEDITION OF THE USNS HAYES Final Report

J. M. Goodman and A. J. Martin 30 Mar. 1982 53 p refs (RR0330244)

(AD-A112563; NRL-MR-4720) Avail: NTIS HC A04/MF A01 CSCL 20/14

Between 1 January and 15 April 1981, investigators at the Naval Research Laboratory participated in comprehensive radiowave propagation studies in the American longitude zone using radio receivers installed aboard the US Naval Research Ship USNS Hayes (T-AGOR-16). Both UHF and L-band data were obtained using the transmissions from the Atlantic FLTSATCOM and from the existing complement of NAVSTAR/GPS satellites respectively. This report primarily describes the UHF scintillation data obtained during the Hayes expedition which covered geographic latitudes between 35 degrees N and 50 degrees S with considerable concentration in the Southern Hemisphere. Preliminary study of the L-band data is underway. Strong scintillation at 250 MHz was observed (> or = 20 dB) in the vast majority of nocturnal periods for which the magnetic dip angle (I) between 0 deg and + or - 40 deg. This corresponds to roughly + or - 30 deg in geomagnetic (centered dipole) latitude and about + or 1 - 23 deg dip latitude. This represents an expansion in the equatorial scintillation zone currently thought to apply to UHF scintillation and is thought to be circumstantially related to the enhanced solar activity during the period of observation. GRA

N82-27584# Naval Research Lab., Washington, D. C. Target Characteristics Branch.

LINEAR FREQUENCY MODULATION DERIVED POLYPHASE PULSE-COMPRESSION CODES AND AN EFFICIENT DIGITAL IMPLEMENTATION Interim Report

B. L. Lewis and F. F. Kretschmer, Jr. 2 Nov. 1981 11 p refs

(SF12141491)

(AD-A107268; NRL-8541) Avail: NTIS HC A02/MF A01 CSCL 17/9

In previous publications, the authors introduced a new class of polyphase pulse-compression codes and techniques for use in digitally coded radars. Such codes and compressors can be employed to obtain much larger time-bandwidth products (pulse compression ratios) than are feasible with analog dispersive delay lines. It is the purpose of this report to extend this class to include two new codes, one of which is tolerant of precompression bandwidth limitation. These new phase codes are conceptually derived from a linear frequency modulation waveform (LFMW) and are more Doppler tolerant than other phase codes derived from a step approximation to a LFMW. This report will also describe an efficient technique for implementing these new phase codes in a digital pulse-expander-compressor and will present performance data. It should be noted that these phase codes are designed to be used both on transmission and reception to insure that the receive filter matches the transmitted waveform independent of time differences between the leading edge of the echo and a sampling pulse, i.e., independent of target range. The two new phase codes will be called the P3 and P4 codes to distinguish them from the P1 and P2 codes. The P3 code is not precompression bandwidth limitation tolerant, but is much more Doppler tolerant than the Frank or P1 and P2 codes. The P4 code is a rearranged P3 code with the same Doppler tolerance and with better precompression bandwidth limitation tolerance. GRA

N82-27585# Naval Research Lab., Washington, D. C. Ionospheric Effects Branch.

UHF MARITIME SCINTILLATION MEASUREMENTS DURING SOS 1981. A QUICK-LOOK REPORT Interim Report

J. M. Goodman and A. J. Martin 30 Mar. 1982 35 p refs (RR0330244)

(AD-A112648; NRL-MR-4762) Avail: NTIS HC A03/MF A01 CSCL 20/14

Between 1 January and 15 April 1981, investigators at the Naval Research Laboratory participated in a comprehensive Study of Scintillation (SOS '81) in the American longitude zone using radio receivers installed aboard the US Navy Research Ship USNS Hayes (T-AGOR-16). Both UHF and L-band data were obtained using the transmission from the Atlantic FLTSATCOM and from the existing complement of NAVSTAR/GPS satellites respectively. This report describes the UHF scintillation data obtained during the Hayes expedition which covered geographic latitudes between 35 deg N and 50 deg S with considerable concentration in the Southern Hemisphere. Strong scintillation at 250 MHz was observed (> or = 20dB) in the vast majority of nocturnal periods for which the magnetic dip angle (I) was within + or - 40 deg of the magnetic dip equator. This corresponds to roughly + or - 30 deg in geomagnetic latitude. This suggests that a substantial expansion in the equatorial UHF scintillation zone should be incorporated into existing models. It is thought that this new result may be circumstantially related to the enhanced solar activity during the period of observation. Author (GRA)

N82-27586# Harry Diamond Labs., Adelphi, Md.

ANALYSIS OF THE ELECTROMAGNETIC MODES PROPAGATED ON AN ELECTRON BEAM

G. Daniel Dockery and Clyde A. Morrison Apr. 1982 45 p refs

(DA Proj. 1L1-61101-A-91-A; HDL Proj. A10036)

(AD-A113671; HDL-TR-1982) Avail: NTIS HC A03/MF A01 CSCL 20/8

The relationship of electron density, current density, and electric field, for an electron beam is derived by using Maxwell's equations and the Lorentz force equation. The resulting wave equations are solved for a ribbon electron bean and a cylindrical beam. It is shown that there exist modes propagating along the beam much the same as waves in dielectric waveguides. However, unlike dielectric waveguides, the number of modes of an electron beam is doubly infinite. One set of waves propagates along the beam with phase velocity greater than the speed of the electrons in the beam. The other set has the phase velocity less than the electrons. The phase velocity of both sets of waves approaches the electron velocity for very large mode number. The total energy propagated down the electron beam is given, and the fraction of energy outside the beam is shown to be larger for a cylindrical beam than for a ribbon beam. GRA

N82-27587# Institute for Telecommunication Sciences, Boulder, Colo.

WIDEBAND PROPAGATION MEASUREMENTS IN THE PRESENCE OF FORESTS Final Report, Apr. 1979 - Dec. 1981

G. A. Hufford, R. W. Hubbard, L. E. Pratt (Army Communications-Electronics Command, Ft. Monmouth, N.J.), J. E. Adams, S. J. Paulson, and P. F. Sass Ft. Monmouth, N.J. CECOM Jan. 1982 172 p refs

(Contract CS-1-CS029-CS-WA; DA Proj. 1L1-62701-AH-92)

(AD-A113698; CECOM-82-CS029-F) Avail: NTIS HC A08/MF A01 CSCL 20/14

This report describes the conduct and provides representative analysis of the results of an experimental program designed to measure the transmission characteristics of UHF radio channels in a forested environment. The program described is the initial phase of what may become a much larger effort, and the emphasis here is to test the experimental procedures, equipment, and analysis technique for their appropriateness to the long-range objectives, and to gain some preliminary insight to the propagation parameters important for wideband and spread-spectrum systems. The test instrumentation used was a pseudo-noise channel probe with 300-MHz bandwidth. It provided a direct representation of the channel impulse response which then was recorded in both analog and digital formats. The analyses of these recordings now provide measures of overall path loss, multipath delay spreads, and derived spectral responses. Author (GRA)

N82-27588# Ball Aerospace Systems Div., Boulder, Colo.
ADVANCED MICROSTRIP ANTENNA DEVELOPMENTS. VOLUME 2: MICROSTRIP GPS ANTENNAS FOR GENERAL AVIATION AIRCRAFT Final Report, Apr. 1979 - Jun. 1980
Gary G. Sanford and Brian D. Gross Mar. 1982 48 p
(Grant DOT-TSC-1397-1)
(AD-A113620; FAA-EM-80-12-2; TSC-FAA-80-15-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report describes the application of microstrip antenna technology to the design of general aviation (G/A) aircraft antennas for use with the Global Positioning System (GPS). For most G/A aircraft, only single frequency operation will be required. However, air-carrier and some large corporate aircraft may make use of dual-frequency operation. For this reason, some dual-frequency designs have been investigated. The main effort was given to the design of antennas with broad beamwidths which could be switched or steered to compensate for aircraft maneuvers, with the goal of maintaining near-hemispherical carriage in flight. A hybrid microstrip crossed-slot and sleeve-dipole element used with a suitable combining network gives a suitable, controllable broad-beam pattern. This element and its performance are described. In addition, radiation patterns are presented using scale-model aircraft and simple crossed-slot antennas. Author (GRA)

N82-27589# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
ANALYTICAL COMPENSATION FOR NEAR-FIELD PROBE POSITIONING ERRORS IN CALCULATED FAR FIELD ANTENNA PATTERNS Final Report, 15 Jul. 1978 - 14 Jan. 1982
Edward B. Joy Apr. 1982 8 p
(Contract DAAG29-78-C-0029)
(AD-A113788; ARO-15646.5-EL) Avail: NTIS HC A02/MF A01 CSCL 20/14

The problem addressed in this research is the derivation and development of an analytical technique for compensation of probe positioning errors in the calculation of far-field antenna patterns made from near-field measurements. Author (GRA)

N82-27590# Illinois Univ., Urbana. Coordinated Science Lab.
SPREAD-SPECTRUM RANDOM-ACCESS COMMUNICATIONS FOR HF CHANNELS Final Technical Report, 21 Aug. 1980 - 21 Aug. 1981
Michael B. Pursley and Bruce E. Hajek 21 Aug. 1981 84 p
(Contract N00014-80-C-0802)
(AD-A113935; UILU-ENG-81-2250; R-919) Avail: NTIS HC A05/MF A01 CSCL 20/14

Research on this contract covered several problems in the area of spread-spectrum random-access communications for fading channels. The results are applicable to the Navy's intra-task-force communications network. GRA

N82-27591# California Univ., Los Angeles. Dept. of System Science.
ANTI-JAM ANALYSIS OF FREQUENCY HOPPING M-ary FREQUENCY SHIFT KEYING COMMUNICATION SYSTEMS IN HIGH FREQUENCY RAYLEIGH FADING CHANNELS Ph.D. Thesis
Dan Avidor Jun. 1981 157 p refs
(Contract N00014-80-K-0935; RF21222805)
(AD-A113543) Avail: NTIS HC A08/MF A01 CSCL 17/4

A certain type of M-ary Frequency Shift Keying (MFSK) communication systems, which use Frequency Hopping (FH) to combat jamming is studied in this work. In particular, the performance of such systems over High Frequency (HF) sky-wave channels, when subjected to intentional jamming, is the main topic of this study. The channels considered are characterized by Rayleigh fading and additive Gaussian noise. To combat jamming the communication system hops over the total spread spectrum bandwidth, which is many times larger than the 'instantaneous' bandwidth occupied by the MFSK signal. Located within the HF band and using sky-wave as the dominant propagation mode, the spread spectrum bandwidth is typically nonuniform, time dependent, and congested by many other users of the electromagnetic spectrum. In such an environment, Frequency Hopping FH MFSK systems seem to be more practical than 'Direct Sequence' spectrum spreading techniques. A FH/MFSK system can be easily programmed to use a noncontiguous band, thereby avoiding strong interfering signals that should not be interfered with. GRA

N82-27592# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ELECTROMAGNETIC TRANSMISSION THROUGH APERTURES IN A CAVITY IN A THICK CONDUCTOR
Yehuda Leviatan, Roger F. Harrington, and Joseph R. Mautz Griffiss AFB, N.Y. RADC Jan. 1982 62 p
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A113189; RADC-TR-81-386) Avail: NTIS HC A04/MF A01 CSCL 20/14

The general problem of electromagnetic coupling from one region to another through an aperture to cavity to aperture system is specialized to the case of electrically small circular apertures in a cylindrical cavity of circular cross section. A simple equivalent circuit for the coupling system is developed. It is found that for certain cavity depths an exceptionally large amount of electromagnetic energy can be transmitted, and that for identical apertures the transmission cross section of the system is independent of the size of the apertures. Author (GRA)

N82-27593# Ohio State Univ., Columbus. Electroscience Lab.
A METHOD OF CHOOSING ELEMENT PATTERNS IN AN ADAPTIVE ARRAY
R. T. Compton, Jr. Jan. 1982 24 p refs
(Contract N00019-81C-0093)
(AD-A112927; ESL-713603-4) Avail: NTIS HC A02/MF A01 CSCL 09/5

A procedure for choosing element patterns in an adaptive array is described. The method is useful when the adaptive array must provide sector coverage, i.e., when the desired signal may arrive from anywhere within some sector of space. The procedure is to start with an initial set of elements and then add extra elements one at a time until suitable performance is obtained. The condition that must be satisfied by each new element to obtain maximum performance improvement is derived. Author (GRA)

N82-27594# Naval Ocean Systems Center, San Diego, Calif. Communications Research and Technology Div.
MAXIMUM LIKELIHOOD SEQUENCE ESTIMATION FOR UNKNOWN, DISPERSIVE, AND TIME VARIANT COMMUNICATION CHANNELS
L. E. Hoff, R. L. Merk, and S. Norvell 30 Sep. 1981 52 p refs
(ZF66212001)
(AD-A113867; NOSC/TR-727) Avail: NTIS HC A04/MF A01 CSCL 09/4

The Maximum Likelihood Sequence Estimation (MLSE) algorithm is one of a number of techniques developed for processing signals with intersymbol interference. The MLSE algorithm is optimum in the sense that it minimizes the probability of error. This report describes the intuitive and mathematical basis for the MLSE algorithm. The derivation assumes the channel is known and time invariant. In Navy communications (underwater acoustic and hf radio channel) channel characteristics are unknown to the receiver. This study's approach to the problem is to attach to the transmitted message a preamble consisting of a known bit sequence. The receiver uses it to estimate channel response. The MLSE algorithm is applied to the received data using the estimated channel response in lieu of the actual. Performance is then compared under ideal (known channel characteristics) and realistic (estimated channel characteristics) conditions, as a test on the effectiveness of the channel estimation procedure. This approach can be extended to channels exhibiting time variations. Updates to the matched filter and metrics are performed so that the channel distortion is more precisely represented by the estimated encoding. This is done periodically by injecting a short, known sequence into the message stream. The adaptive MLSE algorithm was tested on signals recorded during an hf field test. GRA

N82-27595# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
INTEGRATED OPTICAL TRANSMITTER AND RECEIVER

Status Report, 1 Sep. - 18 Sep. 1981
P. D. Dapkus 18 Sep. 1981 8 p
(Contract N00173-80-C-0485; ARPA Order 4036)
(AD-A112967) Avail: NTIS HC A02/MF A01 CSCL 17/2

An integrated electronic driver was completed. This included sulfur implanted diffused planar TELD's and Si implanted FET's. A high speed transmitter packaging was also developed. A GaAlAs/GaAs MOCVD reactor was serviced in order to continue laser development. High speed measurements were made of narrow diffused stripe laser structures grown by MOCVD for implementation into the integrated transmitter structure. The ability to accurately tune the properties of the GaAlAs layer were investigated. S.L.

N82-27596# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF A VOICE FUNNEL SYSTEM Quarterly Technical Report, 1 Aug. - 31 Oct. 1981
R. D. Rettberg Mar. 1982 19 p
(Contract MDA903-78-C-0356; ARPA Order 3653)
(AD-A112956; BBN-4927) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report covers work performed on the development of a high-speed interface, called a Voice Funnel, between digitized speech streams and a packet-switching communications network. GRA

N82-27597# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF A VOICE FUNNEL SYSTEM Quarterly Technical Report, 1 Nov. 1981 - 31 Jan. 1982
R. D. Rettberg Mar. 1982 43 p
(Contract MDA903-78-C-0356; ARPA Order 3653)
(AD-A112994; BBN-4928) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report covers work performed on the development of a high-speed interface, called a Voice Funnel, between digitized speech streams and a packet-switching communications network. GRA

N82-27598# Defense Communications Engineering Center, Reston, Va. Transmission Engineering Directorate.
PERFORMANCE ANALYSIS OF DIGITAL LOS LINK AT NAVCOMMSTA H. E. HOLT, AUSTRALIA
N. J. Sorovacu Dec. 1981 46 p refs
(AD-A113079; DCEC-TN-30-81) Avail: NTIS HC A03/MF A01 CSCL 17/2

The NAVCOMMSTA H. E. HOLT analog link M2008 is scheduled for digital operation using DRAMA equipment in FY 82. NAVSEEACT PAC asked for DCEC assistance in engineering the new digital link with special consideration requested to address the significance of multipath fading and the need for a midpath repeater to meet DCS performance criteria. This technical note contains the requested technical information. Author (GRA)

N82-27599# Defense Communications Engineering Center, Reston, Va. Transmission System Implementation Div.
PERFORMANCE PREDICTIONS FOR ANALOG TERRESTRIAL LINE-OF-SIGHT AND OVER-THE-HORIZON RADIO PATHS
Nicholas J. Sorovacu Dec. 1981 313 p refs
(AD-A113078; DCEC-EP-23-81) Avail: NTIS HC A14/MF A01 CSCL 17/2

This report presents standardized procedures for predicting the performance of DCS terrestrial LOS and OTH radio paths. These procedures are intended primarily for the use of Quality Assurance personnel in assessing the performance of existing DCS analog radio links and other similar links that are interconnected with DCS. Most of the procedures can be used to design new analog radio paths. Author (GRA)

N82-27600# Defense Communications Engineering Center, Reston, Va.
PERFORMANCE ANALYSIS OF DIGITAL LOS LINK, MANILA EMBASSY, SANTA RITA, PHILIPPINES
N. J. Sorovacu, D. Smith, and D. E. Parker Dec. 1981 90 p refs
(AD-A113045; DCEC-TR-26-81) Avail: NTIS HC A05/MF A01 CSCL 17/2

The U.S. Navy has been tasked to upgrade DCS microwave link M1433, Santa Rita - U.S. Embassy, Philippines, to digital operation using the DRAMA equipment. Impact on bit error rate performance of the new digital radio link caused by a reflection path on Manila Bay is being evaluated in this analysis. Recommendations are made for a link configuration expected to provide an optimum performance in concert with DCS criteria. Author (GRA)

N82-27601# Clarkson Coll. of Technology, Potsdam, N.Y.
DEFINITION AND LOCATION OF HOMOGENEOUS REGIONS IN RADAR BACKSCATTER Technical Report, May 1980 - Aug. 1981
Bruce A. Black, Mohammed Arozullah, and Steven T. Cummings Feb. 1982 179 p refs
(Contract F30602-80-C-0192; AF Proj. 2305)
(AD-A113384; RADC-TR-82-10) Avail: NTIS HC A09/MF A01 CSCL 20/14

Two definitions of radar clutter homogeneity are presented and tested on clutter data supplied by the Signal Processing Laboratory at Rome Air Development Center. The two-dimensional spectra of clutter regions are individually tested for compliance with the rough clutter definition. The isodistributive definition utilizes a non-parametric (Kruskal-Wallis) statistical test to locate clutter regions whose individual resolution cells possess identical backscatter populations. The regions which conform to the rough clutter definition of homogeneity are seen to be areas of low intensity backscatter or areas dominated by thermal noise. The isodistributive regions that are located in the clutter data correspond to the areas between high-intensity regions. GRA

N82-27602# Marconi Communication Systems Ltd., Chelmsford (England).
ASSESSMENT OF AUXILIARY DATA PROCESSING Final Report
A. P. Luscombe and R. H. Wealthy (Marconi Space and Defence Systems Ltd.) Paris ESA Dec. 1981 113 p refs
(Contract ESA-4544/80/NL-PP(SC))
(MTR-81/120; ESA-CR(P)-1541) Avail: NTIS HC A06/MF A01

An orbit and attitude determination system is presented. Two auxiliary processing algorithms (Doppler tracker for estimating beam center Doppler frequency and autofocus for estimating Doppler FM rate) are described and their performances with SEASAT-1 SAR data are evaluated. Accuracy is achieved with little change to the satellite platform (apart from real time transmission of attitude measurements). The orbit determination system uses S band range and range rate measurements made at ground tracking stations, giving up to 50 m accuracy for the tracking period itself, and 500 m accuracy for 12-hr predictions. The PFM Earth reference attitude sensor data transmitted to the ground during the pass are available for fast delivery processing. Measurement accuracy is 0.05 deg about each axis. The tracking algorithm estimates are converted to absolute values, using the attitude and orbit data. The autofocus algorithm is only used if orbit data are unavailable at processing time. Real time auxiliary data used for fast delivery processing give 1 km location accuracy for ice monitoring or ship routing. Accuracy within 100 m is possible, using full attitude and orbit data. Author (ESA)

N82-27603# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
METALLIZATION OF CFRP REFLECTOR. PHASE 1 Final Report
R. Sippel, R. Wagner, J. D. Chauvy (W. Fluehmann A.G.), J. C. Puippe (W. Fluehmann A.G.), K. Kuenzi (Bern Univ.), C. Maetzler (Bern Univ.), and E. Schanda (Bern Univ.) Paris ESA Aug. 1981 73 p refs
(Contract ESA-4617/81/F-DD(SC))
(ESA-CR(P)-1545) Avail: NTIS HC A04/MF A01

The state of the art of electrochemical and physical metallization of CFRP sandwich reflectors is surveyed. Electrical, thermal, and test requirements are outlined. Of the electrochemical processes, direct metallization, or metallizing a mandrel then applying the CFRP are considered. Ion beam sputtering, aluminum flame spraying, and gluing are discussed. Electrical properties of metallizations can be assessed, using a resonator for high sensitivy measurements on small samples (during development) and with

a radiometer for full scale tests. Analysis of electrical performance, mechanical and thermal properties and chemical behavior of test samples shows that indirect electromechanical plating, aluminum flame spraying and gluing of foil strips are promising techniques. Acoustic noise and thermal cycling tests are needed in order to decide between these processes. Author (ESA)

N82-27604# Marconi Co. Ltd., Chelmsford (England). Research Labs.
THE SAR/SCATTEROMETER STUDY (SAR IN 2D-2FS OPERATION) Final Report
A. B. E. Ellis and C. Hodge Paris ESA 16 Feb. 1981 53 p refs
(Contract ESA-4587/81/F-DD(SC))
(Y/215/587/; ESA-CR(P)-1548) Avail: NTIS HC A04/MF A01

Ocean scatterometer and SAR equipment commonality on ERS-1 was examined. Reduction of mean power and the effects of reduction on the system, and data handling prior to recording and transmission to the ground were studied. Mean power can best be reduced by reducing pulse length while maintaining bandwidth. The short pulse lengths of the SAR and wave scatterometer are compatible with the SAR klystron. A separate TWT is proposed for the wind scatterometer. Since this is a long pulse transmitter, the klystron is regunned in order to enable it to operate in a long pulse mode if the TWT fails. Data processing software and hardware choice depends on the amount of auxiliary data required and synchronizing problems associated with each system in the final configuration. Author (ESA)

N82-27605# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
INFORMATION DISSEMINATION AND SATELLITE TELEVISION [TELEMATIQUE ET DIFFUSION SPATIALE]
A. Dauguet 1981 11 p ref In FRENCH Presented at Journees Intern.: Telematique et Espace, Paris, 18-19 Mar. 1981
(SNIAS-821-422-101) Avail: NTIS HC A02/MF A01

Satellites dedicated to information dissemination (SBS; Telecom 1) are discussed and the potential of television satellites to contribute to this service is assessed. The joint Franco-German program, TDF-1/TV-Sat, is described. Due to video signal characteristics, considerable transmitting time is available for services, such as teletext. Telemessages are another possible use. Educational television and videotext systems can also be carried by satellite television. The modest cost of satellite television reception is pointed out. Rapid development of user interactive satellite telecommunications is forecast. Author (ESA)

N82-27606# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
TELEVISION SATELLITE PROGRAMS [LES PROGRAMMES DE TELEVISION DIRECTE]
Pierre Usunier 1981 17 p In FRENCH Presented at Journees Intern: Telematique et Espace, Paris, 18-19 Mar. 1981
(SNIAS-821-422-102) Avail: NTIS HC A02/MF A01

Why and how satellite television transmission is being done, especially TDF-1/TV-Sat, are considered. The need for satellite television is assessed in terms of extending areas of reception. Problems of optimal signal strength, installation cost, and spillover are assessed. Political, cultural, and commercial aspects are also covered. Diverse satellite television systems to date are compared. The TDF-1/TV-Sat program is outlined as a practical application of what until now has been only experimental. System characteristics and its modular design are shown. Possible uses beyond television (teletex; viewdata; videotext) are speculated on. Author (ESA)

N82-27607# Bosch (Robert) G.m.b.H., Stuttgart (West Germany). Zentralabt. Forschung.
ELECTRONIC VIDEO SYSTEM: PHASE 1 Final Report
Gerd Bock, Winfried Horstmann, Hans-Eckard Krueger, Bernt Mueller, Horst Guenter Mueller, Kurt Neuffer, Ulrich Reimers, Horst Timm, Klaus-Peter Wendler, and Hans-Wilhelm Zappen Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 318 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-015; ISSN-0340-7608) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 48,30

The system concept (portable color camera with semiconductor image converters, integrated magnetic tape recording equipment and corresponding playback unit) can be implemented. A model of a CID hybrid camera was constructed. A miniaturized recorder for 0.15 in tape was assembled as a model. The problem of recording in color at narrow bandwidth was solved, using serial processing of compressed color signals (Timeplex). For this purpose, a digital concept was worked out after initial tests, using an analog method. It is possible to produce five-track single-turn heads as recording elements, using thin film technology. These heads, together with magnetoresistive playback heads, yield better results than combined inductive recording/playback elements. Author

N82-27608# Valvo G.m.b.H., Hamburg (West Germany). Unternehmensbereich Bauelemente
VLSI CIRCUITS FOR TELETEXT (VIDEOTEXT) AND VIEWDATA Final Report
Ralph vonVignau and Guenther Staecker Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-024; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlrsuhe, West Germany DM 14,70

The application of existing teletext decoders by the German television industry was investigated. Rapid development of circuits, based on the UK standard for videotext and viewdata, was stressed. Interactive videotext and broadcast videotext were considered. Dynamically redefinable character sets are discussed and the circuit design of a video display generator is presented. Modem and picture attributes are treated. The possibilities for VLSI of teletext decoder circuits are established. International standards of teletext data transmission are called for.
Author (ESA)

N82-27609# Forschungsinstitut fuer Anthropotechnik, Bonn (West Germany).
INFLUENCE OF CONTRAST ON SPATIAL PERCEPTION IN TV DISPLAY OF MOVING IMAGES [EINFLUSS DES KONTRASTES AUF DIE RAUMWAHRNEHMUNG BEI TV -FLUGAUSSENSICHT- DARSTELLUNGEN]
H. Heising Sep. 1981 80 p refs In GERMAN; ENGLISH summary
(FB-50) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

A low cost visual simulation system was developed which involves a hybrid computer controlled transformation of perspective on a raster scan TV display. It is applicable to a wide range of simulation tasks, including training and research, but is especially useful in facilitating detection of moving objects and reducing frame rate in RPV applications with a number of advantages, e.g., reduction of bandwidth and improved protection against jamming. Because of the perspective transformation in TV raster scan, a change of contrast can occur during the display of moving images. Therefore, it is of interest to know the effect of this contrast change on human spatial perception. The investigations undertaken led to the conclusion that the physical contrast in the ratio range of 1:11 to 1:25 (by a medium illuminance of 7 cd/sqm at the white parts of the picture) does not influence human distance and height judgments. Author (ESA)

N82-27610# National Bureau of Standards, Washington, D.C.
PROCEEDINGS OF A CONFERENCE ON TELECOMMUNICATION TECHNOLOGIES, NETWORKINGS AND LIBRARIES Final Report
Nancy K. Knight, ed. Dec. 1981 93 p Conf. held at Gaithersburg, Md., 3 Jun. 1977
(PB82-133414; NBS-SP-610; LC-81-600069) Avail: NTIS HC A05/MF A01 CSCL 17B

Current and developing technologies for digital transmission of image data likely to have an impact on the operations of libraries and information centers or provide support for information networking are reviewed. Technologies reviewed include slow scan television, teleconferencing, and videodisc technology and standards development for computer network interconnection

through hardware and software, particularly packet switched networks computer network protocols for library and information service applications, the structure of a national bibliographic telecommunications network, and the major policy issues involved in the regulation or deregulation of the common communications carriers industry. GRA

N82-27611# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

FIBER OPTIC COMMUNICATIONS: AN UPDATE

Joseph A. Hull Oct. 1981 25 p refs
(PB82-153974; NTIA-SP-81-14) Avail: NTIS HC A02/MF A01 CSCL 17B

Optical fiber communications technology has matured from laboratory and field trial stages to cost competitive operational systems. Changes in technology, which allow the use of longer wavelengths, continue to improve potential performance and provide the basis for major long-haul and undersea cable communication systems. Rapid progress in the development of standards is evident, both domestic and international. The evolution of optical fiber communications as a primary communications media rather than a selective replacement for existing communication links portends extensive change in the systems and services available. An assessment of the current status and some expectations for the future are presented. GRA

N82-27612# National Bureau of Standards, Washington, D.C.

A DISCUSSION OF GRIDNET SIMULATION RESULTS Progress Report, 30 Nov. 1980 - 4 Sep. 1981

R. T. Moore Nov. 1981 17 p refs Sponsored by DNA
(PB82-142894; NBSIR-81-2414) Avail: NTIS HC A02/MF A01 CSCL 17B

Algorithms which permit messages to be routed from any source to any destination in a network with thousands of nodes were modified. Only limited local knowledge of network operability status was used. Estimates of the network's delay and throughout characteristics as a function of traffic loading were developed. The GRIDNET was developed into a highly reliable and highly survivable data communications network that supports traffic between a large number of nodes in an effective and efficient manner. GRA

N82-27613# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

MEDIUM, LONG AND VERY LONG WAVE PROPAGATION (AT FREQUENCIES LESS THAN 3000 KHZ)

J. S. Belrose Feb. 1982 266 p refs In ENGLISH; partly in FRENCH Meeting held in Brussels, 21-25 Sep. 1981
(AGARD-CP-305; ISBN-92-835-0311-2) Avail: NTIS HC A12/MF A01

Electromagnetic wave propagation information at ELF and VLF frequencies is reviewed and the current state of knowledge in this frequency band is summarized with emphasis on the propagation medium, ELF propagation, VLF propagation, LF propagation, MF propagation, numerical modelling of the propagation medium, and applications. For individual titles, see N82-27614 through N82-27651.

N82-27614# Communications Research Centre, Ottawa (Ontario).

THE PROPAGATION MEDIUM: AN OVERVIEW

John S. Belrose *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 18 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Electron and ion number density and collision frequency height profiles in the lower E region and in the D region of the ionosphere (heights below 100 km) are reviewed. Sources of ionization, electron loss rates, the height distribution of nitric oxide, ozone, and 02(delta g), and D region modelling are discussed. Variations with latitude, over dawn, and during winter are considered as well as geomagnetic post storm effects. Solar X-ray flares effects, solar proton events, and high energy patparticle (electron) events are among the geophysical disturbances considered. A.R.H.

N82-27615# Army Research Office, Research Triangle Park, N. C.

STUDIES OF THE D-REGION BY THE PARTIAL REFLECTION OF MF RADIO WAVES Ph.D. Thesis

W. A. Flood, Harvey N. Turner, T. E. Shirley, and S. D. Collins *In* AGARD Medium, Long and Very Long Propagation Feb. 1982 15 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

A series of coordinated measurements of the D-region was carried out at a frequency of 2.66 MHz. It was shown that the randomly phased angular spectrum approximation which is central to the measurement of ionospheric winds is valid for D-region echoes. Measurements of the complex spatial correlation coefficient of D-region echoes were used to estimate the half power, half cone angle of arrival of D region echoes. The mean half cone angle was found to increase between 68-80 kilometers and then to remain constant at a value of 13 deg. Above 80 kilometers the variance of the angle of arrival increased with altitude. The implications of these cone angle measurements on the accuracy of D-region electron density profiles measured by the partial reflection technique are discussed. Screened noon-time values of D-region electron density profiles derived from the 'partial reflection' technique were analyzed to determine seasonal variations of electron density over the altitude range 68-88 kilometers. Examples of days of anomalous winter absorption are clearly evident. Amplitude distribution of D-region echoes supports the hypothesis that the echoes were drawn from a Rayleigh population. This result and the fact that D-region echoes are continuous with altitude are considered evidence that the source of these echoes is volume backscattering from fluctuations of refractive index. A.R.H.

N82-27616# Rome Air Development Center, Hanscom AFB, Mass. Propagation Branch.

VLF/LF PULSE REFLECTION MEASUREMENTS OF THE POLAR D-REGION DURING QUIET AND DISTURBED IONOSPHERIC CONDITIONS

John P. Turtle, John E. Rasmussen, Wayne I. Klemetti, and Paul A. Kossey *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 12 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

A short pulse VLF/LF ionosounder to determine the characteristics of the polar D-region during quiet and disturbed conditions is described. Data obtained at Thule AB, Greenland, near the center of the polar cap, are presented giving information on the D-region's height and reflectivity as a function of time. Under quiet conditions there are marked variations in the D-region due to the effects of diurnal and seasonal changes in solar illumination. Energetic particle events produce dramatic changes in both the height and reflectivity of the D-region which can exhibit a complex behavior throughout the duration of the event. The severity of the D-region effects is highly dependent on seasonal illumination conditions. Data on ionospheric reflectivity illustrate normal seasonal and diurnal variations, data from disturbed periods show the interaction between propagation parameters and energetic particle ionization, solar ionizing and photodetaching radiations. A.R.H.

N82-27617# Lockheed Missiles and Space Co., Palo Alto, Calif.

THE INFLUENCE OF PRECIPITATING ENERGETIC PARTICLES ON THE PROPAGATION MEDIUM

W. L. Imhof, R. C. Gunton, J. B. Reagan, R. E. Meyerott, E. E. Gaines, and T. R. Larsen (Norwegian Defence Research Establishment, Kjeller) *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 9 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Measurements of precipitating particles with electron/proton spectrometers and also with bremsstrahlung X-ray sensors from several satellites during the 1971-1980 time frame provide the basis for studying the morphology of the propagation medium as related to long-wave signal transmission. From the measured fluxes, energy spectra, and pitch-angle distributions of the particles, ion-pair production profiles are calculated and electron density profiles subsequently obtained with application of effective electron loss rates. The temporal, latitude, longitude, and altitude variations associated with electron precipitation and with major

solar particle events summarized along with calculations of their effects on ELF propagation. Particular use is made of the nearly simultaneous worldwide measurements of electron precipitation performed via the newly developed satellite bremsstrahlung X-ray technique. A.R.H.

N82-27618# Rome Air Development Center, Hanscom AFB, Mass. Propagation Branch.

VLF/LF PULSE REFLECTIONS FROM LAYERS BELOW THE IONOSPHERIC D-REGION

J. E. Rasmussen, P. A. Kossey, and J. P. Turtle *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 10 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

Long wave ionospheric reflectivity data are described from experiments using a VLF/LF pulse ionosounding system. The sounding technique utilized pulses so short, that even at distances of a few hundred kilometers from the transmitter, ground wave and ionospherically reflected sky wave pulses were received separated in time. Pulse reflection data are shown that strongly suggest the simultaneous presence of at least two discrete reflections from different heights in the daytime ionosphere. The upper reflections are identified with the classical D-region, caused primarily by Lyman alpha radiation, while the low-altitude reflections, which occur from shortly before sunrise to shortly after sunset, are believed to be due to ionization caused by cosmic rays and photodetachment. The variability of the low altitude daytime ionosphere is described from VLF/LF pulse reflection data obtained during different seasons, at mid- and low-geomagnetic latitudes, and over different phases of the solar cycle. The effects of the low altitude ionization on the propagation of long radio waves are estimated. Author

N82-27619# Bonn Univ. (West Germany). Radioastronomical Inst.

VLF ATMOSPHERICS AS A TOOL FOR PROBING VLF PROPAGATION CONDITIONS

J. Schaefer and H. Volland *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 12 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

A technique for receiving and analyzing atmospherics signals and for deriving the VLF-propagation conditions is described. The equipment consists mainly of a receiver/analyzer with an on-line desktop computer. The computer controls the observations and analyses the received parameters in real time, so that the results, e.g., the reference height of the lower ionosphere or the strengths and locations of the thunderstorm activity centers, can be printed out immediately or displayed on a world map with a small desktop plotter. The data are also stored on magnetic tape cassettes. These measurements are used to investigate the short and long-term as well as the local and global behavior of the lightning activity and the VLF-propagation conditions and to elucidate their correlation to atmospheric electric and possibly also external (e.g. solar) parameters. Some results of the measurements, including statistical analyses of the received parameters and typical real time plot charts are shown to demonstrate the methods and capabilities of the present system. Author

N82-27620# Paris VI Univ. (France). Lab. de Physique et Dynamique de l'Atmosphere.

PARTICLE-WAVE AND WAVE-WAVE INTERACTIONS GENERATED DURING T.B.F. TRANSMISSION FROM KAFJORD, NORWAY [INTERACTIONS ONDES-PARTICULES ET ONDE-ONDE ENGENDREES PENDANT LES TRANSMISSIONS T.B.F. DE KAFJORD, NORVEGE]

M. Garnier, N. Cavaciuti, H. C. Koons, and M. H. Dazey *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 14 p refs In FRENCH; ENGLISH summary Prepared in cooperation with Aerospace Corp., Los Angeles (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

Interactions in the magnetosphere between man-made VLF waves and electrons can produce either an enhancement of the wave or the generation of waves at a different frequency. Furthermore natural emissions can be frequency shifted or modified by a nearby transmitter signal. Injections of VLF waves into the magnetosphere was initiated using a 15 km power line (antenna) tuned at the transmitted frequency. A 1 KW transmitter was used to drive the antenna with a maximum current of 8 amperes. Transmissions were conducted when the SCATHA and GOES II satellites were near the magnetic meridian of the transmitter. Transmitted signals were either keyed fixed frequency or continuous waves swept in frequency. Signals correlated with the transmissions were detected by the satellite receivers on several dates. With the first types of transmission, signals similar to power line harmonic radiation were recorded. Artificially stimulated emissions, chorus elements, and magnetospheric induced quiet band are also likely to have been triggered. Both types of transmissions triggered or enhanced hiss at a constant frequency during fixed frequency transmissions or at a variable frequency during a swept frequency transmission. A.R.H.

N82-27621# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).

GENERATION OF ELF AND VLF WAVES BY MODULATED HF HEATING OF THE POLAR ELECTROJET

P. Stubbe, H. Kopka, M. T. Rietveld, and R. L. Dowden (Otago Univ., Dunedin, New Zealand) *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 6 p refs Sponsored in part by Deutsch Forschungsgemeinschaft (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

Modulated heating of the lower ionosphere, with modulation frequencies in the ELF and VLF range, gives rise to a corresponding modulation of the electron temperature and, thus, of the electrical conductivity. If a polar electrojet current exists, the current density is modulated, and an ELF or VLF signal is generated. Experiments were performed to test this mechanism, using the new ionospheric heating facility at Ramfjordmoen, Norway. It was found that this mechanism is sensitive in the full ELF range and for VLF frequencies exceeding 7 kHz, the upper limit of the VLF receiver used. Author

N82-27622# Naval Underwater Systems Center, New London, Conn. Submarine Electromagnetic Systems Dept.

OVERVIEW OF ELF PROPAGATION

Peter R. Bannister *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 13 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

The extremely low frequency (ELF) band (30 to 300 Hz) has serious deficiencies compared with conventional radio frequencies. It is characterized by a very restricted bandwidth (low data rates) and an extremely large wavelength (inefficient antennas). For special applications, however, involving some of the propagation paths conducted through rock or sea water, it offers the possibility of communication where conventional bands offer none. In the case of long-range communication with submerged submarines, it can also provide low-loss highly-stable propagation in the Earth-ionosphere waveguide. A general overview of ELF propagation is presented. Recently derived simple-form approximate expressions (relating ELF propagation constants to realistic-ionospheric conductivity profiles) are compared with experimentally derived results for daytime and nighttime propagation conditions. Current (unpublished) data measured, simultaneously, in Connecticut and other, more distant, locations are included to elucidate anomalous ELF nighttime field strength degradiations. Author

N82-27623# Pacific-Sierra Research Corp., Santa Monica, Calif.

ELF PROPAGATION IN DISTURBED ENVIRONMENTS

Edward C. Field, Jr. *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 10 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

The effects on long-range ELF propagation from ionospheric disturbances such as solar particle events or nuclear environments, which substantially constrict the Earth-ionosphere waveguide are described. A few results pertain to more common ionospheric phenomena, such as sporadic-E patches. Stratified disturbances usually cause both the excitation factor and the attenuation rate of the TEM waveguide mode to increase. Thus, the signal increases somewhat at short distances, but decreases by several decibels at long distances. The main loss mechanism is Ohmic heating

of heavy ions in the lower ionosphere. Numerical solutions show that a localized disturbance behaves like a cylindrical lens filling a narrow aperture. Lateral diffraction, focusing, and reflection can cause the TEM mode to exhibit a transverse pattern of maxima and minima beyond the disturbance, and a standing wave pattern in front of it. Such phenomena can contribute to spatial fluctuations occasionally observed on ELF transmissions. The focusing and diffraction diminish when the transverse dimension of the disturbance approaches the width of the first Fresnel zone--typically, several megameters. A.R.H.

N82-27624# Norwegian Defence Research Establishment, Kjeller.

ELF PROPAGATION IN POLAR AREAS, MEASUREMENTS AND THEORETICAL FIELD STRENGTH PREDICTIONS

T. R. Larsen, W. L. Imhof, R. C. Gunton, J. B. Reagan, E. E. Gaines, and R. E. Meyerott *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 16 p refs Prepared in cooperation with Lockheed Missiles and Space Co., Palo Alto, Calif. (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

The influence of the ionosphere upon ELF propagation at 75 Hz is discussed using results for the propagation path from the U.S. Navy ELF Wisconsin Test Facility transmitter to Tromso, Norway. This 6 megameter path crosses the Greenland icecap and passes twice through the auroral regions. Full wave computations were made using a waveguide mode program. The propagation path was divided into eight segments taking into account in an approximate way the varying boundary conditions of the actual waveguide. Results are presented and discussed for conditions ranging from ambient to severely disturbed. Disturbed ionospheric conditions such as sporadic E-layers, relativistic electron precipitation, auroral events and solar proton events were modelled. Electron and ion density profiles were deduced from satellite observations in the vicinity of the path. The importance of the electron as well as the ion concentrations is discussed. A.R.H.

N82-27625# Naval Underwater Systems Center, New London, Conn.

ELF NOISE SURVEYS: A REVIEW

Emil F. Soderberg *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 12 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

Noise measurement surveys were conducted in various geographical areas to determine the characteristics of ELF noise in power spectral variation with season and time of day, and of noise correlation between widely separated locations. By far, the majority of measurements were made at ground stations, with a small number having been made above the Earth and in space, and even fewer having been made in the sea. The various surveys are reviewed and the ELF noise characteristics in each area are discussed. Author

N82-27626# Leicester Univ. (England). Dept. of Physics.

A REVIEW OF THE ANALYTICAL TECHNIQUES FOR DETERMINING THE PHASE AND AMPLITUDE OF A VLF RADIO WAVE PROPAGATING IN THE EARTH-IONOSPHERE WAVEGUIDE

T. B. Jones and K. Mowforth *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 16 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

The variation of the phase and amplitude of a VLF wave as a function of distance from the transmitter is calculated by each of three analysis techniques for several Earth ionosphere models and the results obtained compared with each other at various radio frequencies. The zonal harmonic analysis method employs the application of Maxwell's equations and the appropriate boundary conditions, allowing the vertical electric field strength to be calculated at any point remote from the transmitter. The form of the solution is a series summation of zonal harmonics. An approximation permitting the series summation to be performed without a computer consists of forming a complex integral for the Hertz vector which is expressed as a sum of residues which, after suitable transformation, become the waveguide modes. The propagation is then described in terms of the propagating modes in the spherical waveguide formed by the Earth as one wall and the ionosphere as the other. In the wave hop technique, the propagation path is divided into three principal regions and computer computation yields solutions not unlike those of geometrical optics. J.D.

N82-27627# Pacific-Sierra Research Corp., Santa Monica, Calif.

VLF PROPAGATION IN DISTURBED ENVIRONMENTS

Edward C. Field, Jr. *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 10 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

Long-range VLF/LF propagation of transverse magnetic (TM) and transverse electric (TE) signals at frequencies from 10 to 50 kHz is considered. Model ionospheres corresponding to solar proton events or spread-debris nuclear environments are used in full wave calculations. Such disturbances constrict the Earth ionosphere waveguide, increasing excitation factors and attenuation rates. The signals are therefore usually degraded beyond a few megameters, although either enhancement or degradation can occur at shorter distances. Ohmic heating of heavy ions in the lower ionosphere is the main loss mechanism for intense disturbances. Only TM modes are efficiently radiated by ground based transmitters. However, TE signals can be important for air-to-air links with terminal elevations of 20 kft or more, and nearly horizontal trailing wire antennas. Air-to-air TE signals propagate better than TM modes over poorly conducting ground such as exists throughout Greenland and much of Canada, and can fill nulls in the TM signal. For paths over highly conducting ground, TM modes suffer less degradation than TE signals during intense disturbances; but, for ground conductivities less than about 0.0001mhos/m, TM signals are more adversely affected than TE signals. Author

N82-27628# Hulburt (E. O.) Center for Space Research, Washington, D.C. Ionospheric Effects Branch.

MULTIPATH VLF PROPAGATION EFFECTS ON CORRELATION RECEIVERS

Francis J. Kelly, J. P. Hauser, H. M. Beck, and F. J. Rhoads *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 50 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

The effect of electromagnetic propagation at very low frequency in the Earth ionosphere waveguide can distort wideband communication waveforms and produce a splitting of the correlation peak of the received signal at a modal interference null where multipath signals arrive out of phase. Propagation from an inclined dipole antenna trailed behind an orbiting aircraft can cause the split correlation pattern to fluctuate throughout the orbit period. For the case of an MSK (minimum shift keying) signal format, expressions and graphs are given for the correlation vector, as a function of receiver synchronization time and aircraft flight direction. Author

N82-27629# Rome Air Development Center, Hanscom AFB, Mass.

RELATIVE CHARACTERISTICS OF TE/TM WAVES EXCITED BY AIRBORNE VLF/LF TRANSMITTERS

Paul A. Kossey, Edward A. Lewis, and Edward C. Field, Jr. (Pacific Sierra Research Corp., Santa Monica, Calif.) *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 10 p (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

Studies of the characteristics of long radio waves excited by airborne VLF/LF transmitting antennas are described. These antennas provide a source of both conventionally used transverse magnetic (TM) waves and heretofore unused transverse electric (TE) waves. A variety of experimental and theoretical studies are described. Included are discussions of TE/TM signal and atmospheric noise data obtained using balloon, rocket and aircraft platforms, and theoretical studies on the propagation of TE/TM waves under both normal and disturbed ionospheric conditions. The exploitation of the TE polarization for improving the range and reliability of VLF/LF air-to-air communications is also considered. Author

N82-27630# Admiralty Surface Weapons Establishment, Portsdown (England). Communication Div.

PHASE AND AMPLITUDE PERTURBATIONS ON VLF SIGNALS RECEIVED IN THE SEA
C. J. Rigden *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 9 p (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

An experimental investigation into the stability of VLF signals from the GBR (16 kHz) transmitter at Rugby, England when received in the sea is described. The effect of a rough sea surface on these signals is shown. The measured phase and amplitude perturbations on the signals are very small when received above the sea surface or in the sea under calm conditions, but as the sea surface roughness increases the perturbations on the signals received in the sea increase significantly. The results are explained by a simple model which takes into account the variations in sea path length for the VLF signals caused by sea surface waves passing over the receiving aerial. Author

N82-27631# Hulburt (E. O.) Center for Space Research, Washington, D.C. Ionospheric Effects Branch.
ATMOSPHERIC VLF RADIO NOISE AT ELEVATED RECEIVERS: HORIZONTAL AND VERTICAL POLARIZATION
Francis J. Kelly, J. P. Hauser, and F. J. Rhoads *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 16 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

A working computer program model for predicting the horizontally and vertically polarized atmospheric noise at any location, season, time of day, and altitude is presented. The programs which are combined to form the model are described. The WAVEGUID program contains the algorithms necessary to compute all the electric and magnetic components of a propagating electromagnetic wave in a given waveguide mode at any height above the ground, if the vertical electric component of the wave at the ground is known. The COMPWR and NOISLAN programs calculate the amplitudes of the vertical electric VLF noise in the three dominant quasi-transverse magnetic waveguide modes from each equilvalent atmospheric noise source. Predictions obtained using the model are compared with observed data. J.D.

N82-27632# Communications Research Centre, Ottawa (Ontario).
LF PROPAGATION: AN OVERVIEW
John S. Belrose *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 10 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

A survey of those areas where knowledge of LF propagation is inadequate is presented. Studies of propagation on a global scale are stressed. Propagation at frequencies in the LF band (30 to 300 kHz) alter with change in frequency, but there is a drastic difference between propagation characteristics in these adjacent bands. Ionospheric attenuation therefore increases rapidly with frequency, particularly during summer day time. The radiation field and its measurement is discussed. Diurnal variations in phase and amplitude, the variation of amplitude with the solar cycle, and solar/geophysical disturbance variations and post-magnetic storm effects are considered. J.D.

N82-27633# Hulburt (E. O.) Center for Space Research, Washington, D.C. Space Science Div.
LOW FREQUENCY RADIO WAVE PROPAGATION IN THE ATLANTIC AND MEDITERRANEAN AREAS
Francis J. Kelly, F. J. Rhoads, D. J. Baker, and J. A. Murray *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 22 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Data from eighteen long range aircraft flights are compared with the wave hop propagation model of Berry, and areas of agreement and disagreement noted. The field strength of low frequency radio waves from transmitting stations in Iceland, Scotland, Morocco, and Greece was measured under daytime and nighttime conditions. The nighttime waves at about 1 mm seem to oscillate with distance more dramatically than the current model predicts. The daytime fields over all-water paths are often in good agreement with theory, but ground conductivity changes and rough terrain effects not contained in available computer models appear to influence the received fields. The unsatisfactory state of mathematical propagation models for this frequency regime is discussed and some areas for improvement recommended. J.D.

N82-27634# Brussels Univ. (Belgium).
MEASURE OF E.C.D., TIME OF ARRIVAL, AMPLITUDE AND PHASE OF BOTH GROUND AND REFLECTED WAVES OF LORAN-C PULSES
J.-C. Lievin, J.-P. Hamaide, W. Scholiers, and J.-P. Lechien *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 8 p refs Sponsored in part by Fonds National de la Recherche Scientifique and the US Coast Guard (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

An investigation of LORAN C pulses emitted at 100 kHz by the Sylt station (Federal Republic of Germany) and received at Brussels situated at 514 km is described. The pulses are analyzed digitally. After deconvolution of the received wave, the ground wave (already measured with high precision) is subtracted to obtain the reflected wave on the ionosphere. This analysis provides accurate results for time of arrival, amplitude, phase, and ECD of both ground and reflected waves. The heights of the D layer of the ionosphere are also given. Author

N82-27635# Telediffusion de France, Montrouge.
CONSIDERING THE SERVICE ZONE OF A POWERFUL TRANSMITTER BROADCASTING IN KILOMETRIC WAVES [CONSIDERATIONS SUR LA ZONE OF SERVICE D'UN EMETTEUR DE RADIODIFFUSION PUISSANT EN ONDES KIOMETRIQUES]
J. Fonteyne *In* AGARD Medium, Long and Very Long Wave Propagation Aug. 1982 8 p refs In FRENCH (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

France is one of the countries best served by broadcasting in the kilometric band. While signals are received from four transmitters (Allouis, Saarlouis, Radio Monte Carlo, and Radio Luxembourg), there is concern about the quality of reception, especially from Allouis, the national broadcasting transmitter, because the field of service of this transmitter has always been the entire territory. A study of the conditions of listening and of methods for improving confront led to the establishment of charts of zones of coverage (field contours). The diagram of favorable radiation, the effect of interference between ground and ionospheric waves, the eliminations of radioelectric interferences, and the formation of adequate antiparasite regulations are discussed. Transl. by A.R.H.

N82-27636# British Broadcasting Corp., London (England). Div. of Engineering.
MEDIUM FREQUENCY PROPAGATION: A SURVEY
P. Knight *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 17 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

The propagation of ground waves and sky waves at medium frequencies is considered. Variations in daytime and nighttime propagation are discussed. Published ground wave propagation curves applying to land which is smooth and of uniform conductivity are discussed and method for calculating field strengths along mixed land-sea paths, over irregular terrain, and through built up areas are presented. Coupling losses occurring in sky wave propagation due to the existence of the gyromagnetic frequency band of the Earth within the medium frequency band are considered. Polarization coupling loss, which is of importance in tropical regions, and coupling loss between hops on multihop paths are discussed. Enhanced ionospheric cross modulation also occurs at the gyromagnetic frequency. J.D.

N82-27637# Communications Research Centre, Ottawa (Ontario).
REDUCTION IN MF SKYWAVE FIELD STRENGTH AT NIGHT DUE TO MAGNETIC-STORM AND WINTER-ANOMALY-RELATED ABSORPTION
E. L. Hagg *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 9 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Results from a detailed analysis of one year of previously published field strength measurements, taken during high solar activity in 1974-48 at Ottawa on the 1020 kHz KDKA Pittsburgh emissions, show that the strength of the nighttime skywave is controlled by absorption from two apparently unrelated geophysical effects. One of these is the magnetic storm and post-storm effect and the other is the winter anomaly effect. The former effect was dominant throughout the year and was the only factor controlling the field strength during the March through September period. The two-monthly median field strength for this period showed a smooth decrease with increased magnetic activity, from 5 to 19 dB relative to an experimentally determined unabsorbed value. The latter effect was present sporadically during the October through February period. The reduction in field strength due to the winter anomaly alone was from 6 to 11 dB. Author

N82-27638# Bari Univ. (Italy). Inst. di Fisica.
ON THE DISTORTIONS OF THE MODULATED RADIO-WAVES IN THE IONOSPHERE
M. Cutolo, S. Feliziani (Camerion Univ.), and E. Moriconi (Naples Univ.) *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 6 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Ionospheric self-modulation at oblique angles of incidence of frequencies varying between 30 to 5000 Hz broadcast at 150 and 50 kW at 60% modulation is discussed. The dependence of the ionospheric distortion on emitting power is demonstrated. The amplitudes of the first, second, and third harmonics are demonstrated to vary as a function of the broadcast power, leading to the determination that the phenomenon is nonlinear. The modulation percentages of each harmonic were calculated using the Vilienskij equations. It was determined that the percentages of the second and third harmonics are too low in relation to those of the first harmonic and to the emitted percentage of the transmitter. J.D.

N82-27639# Camerino Univ. (Italy). Ist. di Fisica.
IONOSPHERIC SELF-MODULATION OF A MODULATED RADIOWAVE WITH FREQUENCY FAR FROM LOCAL GYROFREQUENCY
M. Cutolo and G. Gaffuri *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 12 p refs Sponsored in part by AF, C. N. R., and Ministero della P. I. (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

The dependence of self modulation on power transmission was studied. An increase in the percentage of received modulation as related to the percentage emitted by the transmitter and the dependence of demodulation or overmodulation on the electromagnetic power was observed. It is suggested that self modulation may have three difference behaviors and that modulation depends on the power emitted which is a nonlinear phenomenon. E.A.K.

N82-27640# Accademia Nazionale dei Lincei, Rome (Italy).
CALCULATION OF THE RESIDUAL MODULATION OF A MODULATED RADIOWAVE REFRACTED BY IONOSPHERE
L. Carlomusto *In* AGARD Medium, Long and Very Long Propagation Feb. 1982 3 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Residual modulation of a modulated radiowave with variable power refracted by the ionosphere was calculated. Bailey's equation was applied for ionospheric equations of a wave refracted by ionosphere. Bailey's equation is utilized to obtain macroscopic quantities. It is shown that it is possible to have demodulation only, with low power and with low modulation frequency. E.A.K.

N82-27641# Middle East Technical Univ., Ankara (Turkey). Dept. of Electrical Engineering.
MEDIUM WAVE MULTI-SECTION GROUNDWAVE PROPAGATION IN MARMARA AND WEST BLACK-SEA REGION-NUMERICAL RESULTS
A. Hizal and A. F. Fer *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 6 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

The medium wave (MF) propagation in maritime communication system in the Black Sea region was numerically analyzed. Two methods were applied: the flat ground two and four section ground wave propagation, and the integral equation solution. Attenuations up to 400 km are needed for estimating the requirements on the transmitter power and the effective antenna height for manageable signal to noise ratios at this particular frequency. The four section formula obtained represents an efficient technique for prediction attenuation for the last sea section of the propagation path. It is shown that MF ground wave is a suitable mode of propagation for ship to shore communication system. E.A.K.

N82-27642# Naval Ocean Systems Center, San Diego, Calif. Electromagnetic Propagation Div.
NUMERICAL MODELING OF THE PROPAGATION MEDIUM AT ELF/VLF/LF
D. G. Morfitt, J. A. Ferguson, and F. P. Snyder *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 13 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Available procedures to determine ionospheric profiles to be used in computing reliable predictions of ELF/VLF/LF signal levels are presented. To design communications and navigational circuits at ELF/VLF/LF, knowledge of radio signal amplitude and phase characteristics are required. Accurate predictions of signal levels as a function of propagation frequency and range is important for reliable communication coverage. Computer programs based on multimodel theory were developed. The ionospheric electron density and collision frequency profiles are important quantities required to depict the real propagation environment. It is found that proper choice of exponential profile produces field strength levels simulate good experimental data. E.A.K.

N82-27643# Lockheed Missiles and Space Co., Palo Alto, Calif.
MODELING OF THE AMBIENT AND DISTURBED IONOSPHERE MEDIA PERTINENT TO ELF/VLF PROPAGATION
J. B. Reagan, R. E. Meyerott, R. C. Gunton, W. L. Imhof, E. E. Gaines, and T. R. Larsen (Norwegian Defence Research Establishment, Kjeller) *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 9 p refs (For primary document see N82-27613 18-32)
(Contract N00014-79-C-0175)
Avail: NTIS HC A12/MF A01

The ion and electron concentration and the electrical conductivity in the ionospheric media during ambient and solar disturbance periods was modelled. Solar particle events (SPE) ranging from moderate to intense in magnitude and differing in spectral hardness are modelled to define the source terms and sometimes electron density profiles. It is shown that during intense SPE's the conductivity at 40 km can be increased over 200 times. The principal ELF attenuation occurs near the bottom of the ionosphere at 20 to 40 km. A secondary loss occurs near the top of the ionosphere due to ohmic dissipation with enhanced electron density. It is concluded that ionospheric modelling provides the basis for experiments with ELF propagation under solar particle disturbed conditions. E.A.K.

N82-27644# Rutherford High Energy Lab., Chilton (England).
MODELS OF THE MIDLATITUDE D REGION AT NOON
W. C. Bain *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 7 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Two models for the electron density distribution in the D-region of the ionosphere for equinox noon and winter noon were developed. Propagation results are calculated for various frequencies in the 16 to 85 kHz frequencies and for distances below 1000 km and compared with measurements over the same frequency/distance combinations. E.A.K.

N82-27645# Naval Ocean Systems Center, San Diego, Calif.
OMEGA
E. R. Swanson *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 15 p refs (For primary document see N82-27613 18-32)

Avail: NTIS HC A12/MF A01

The Omega system with its major propagational characteristics was examined. Omega is a long range, very low frequency (VLF) radio navigation system which provides global coverage for ships and aircrafts. The VLF propagation and application to navigation, and signal coverage are reviewed. An overview is presented of Omega and its administration, synchronization, traditional applications, large ambiquity resolution, special applications, and differential Omega. Combined systems using both Omega and VLF communication signals are also mentioned. E.A.K.

N82-27646# Leicester Univ. (England). Dept. of Physics.
THE EFFECTS OF PROPAGATION OF THE ACCURACIES OF POSITIONS DETERMINED USING OMEGA IN THE UK
T. B. Jones and K. Mowforth *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 29 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Error correction derived from the ONSOD Omega prediction method were applied, an improvement in accuracy, and a different correction method, in which the Omega data are combined with position determination from a satellite navigation system are considered. The signals from three Omega transmitters located on different continents were monitored at three receiving sites in England. Lines of position (LOPs) are derived from the relative phases of the received signals and the intersection of the LOPs yields to receiver location. The derived receiver positions are compared with the known true position of the receivers and the error is determined. Diurnal and seasonal changes in position errors are obtained for all three receivers. At the most northerly receiving site, the magnitudes of the errors are different from those observed at the other two locations. E.A.K.

N82-27647# National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
THE USE OF VLF-COMMUNICATIONS FOR NAVIGATION
C. D. Hardwick *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 7 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Very low frequency (VLF) navigation methods are outlined and compared to other systems. Performance results for typical stand alone systems and for one optimally integrated system with a simple Doppler sensor are presented. It is suggested that modification is made to the station, which will then enhance the effectiveness of VLF navigation. E.A.K.

N82-27648# Colorado Research and Prediction Lab., Boulder.
LORAN-C: AN OVERVIEW OF OPERATIONAL AND PROPAGATION CHARACTERISTICS
Robert H. Doherty and J. Ralph Johler *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 13 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

The Loran-C, a low frequency long range navigation system is discussed. The system's phase format and phase stability are important for navigation and time synchronization. Major calibration for the systems are oriented toward measurements. Loran-C pulse transmission allows distinction between ground wave and sky wave transmission. The pulse provides a transient capable of validating transient propagation theory. It is shown that the Loran-C transmissions are effective diagnostic tools for validating ground impedance and topographic models used in propagation theories. E.A.K.

N82-27649# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
ELECTROMAGNETIC FIELDS OF DIPOLE ANTENNAS IN THE PRESENCE OF LAYERED MEDIA
J. A. Kong, W. C. Chew, and T. M. Habashy *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 8 p refs Sponsored in part by Schlumberger-Doll Research Center (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

Electromagnetic fields due to a dipole antenna in the presence of layered media were formulated in integral forms and solved with the following techniques: brute force integration methods; modal approach by finding the residues for the integrals; image source approach by using the saddle point method; and hybrid techniques with combinations of the above approaches. It is found that for very long wavelengths or for sufficiently thin layer thickness the normal mode approach is more useful, for shorter wavelength or thicker layers the image method is more efficient and accurate. Various numerical results are illustrated. E.A.K.

N82-27650# Raytheon Co., Portsmouth, R. I.
NEW TECHNOLOGY FOR ELF RADIATORS: A REVIEW OF AIRBORNE, ROCKET-BORNE AND SPACE-BORNE ANTENNAS
Mario D. Grossi *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 17 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A02/MF A01

Engineering practicality of the ELF system which depends essentially upon the design parameters of the radiator at the transmitting terminal is discussed. Feasibility centers on the achievable intensity of the electric or magnetic moments. Long wires that trail an airplane or are suspended vertically from it are used as effective electric dipoles. Airborne loops, cryogenic and noncryogenic, are also considered. It is shown that there is a large source of electrodynamic primary power, that can be utilized to energize the ELF system. E.A.K.

N82-27651# LuTech, Inc., Berkeley, Calif.
SQUID TECHNOLOGY AND ITS COMING IMPACT ON COMMUNICATION SYSTEMS
Claudia D. Tesche *In* AGARD Medium, Long and Very Long Wave Propagation Feb. 1982 5 p refs (For primary document see N82-27613 18-32)
Avail: NTIS HC A12/MF A01

The superconducting quantum interference device (SQUID), a low noise flux to voltage transducer used in sensitive superconducting magnetometer systems, is discussed. The dc SQUID consists of a superconducting loop interrupted by two Josephson junctions. A lumped circuit element model for the dc SQUID is presented. The magnetic field resolution of a pick up coil coupled inductively to the device is derived as a function of the device parameters. The operation and resolution of a typical system and the development of high resolution devices with energy factors approaching the quantum limit are described. E.A.K.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-27652# Mayo Clinic, Rochester, Minn. Special Purpose Processor Development Group.
LEADLESS CHIP CARRIER PACKAGING AND CAD/CAM-SUPPORTED WIRE WRAP INTERCONNECT TECHNOLOGY FOR SUBNANOSECOND ECL Interim Report, 1 Jul. 1980 - 30 Jun. 1981
Barry K. Gilbert Wright-Patterson AFB, Ohio AFWAL Nov. 1981 222 p
(Contract F33615-79-C-1875; AF Proj. 6096)
(AD-A113082; AFWAL-TR-81-1206) Avail: NTIS HC A10/MF A01 CSCL 09/1

This report describes the results of work conducted to develop rapid methods for designing and prototyping high-speed digital processor systems using subnanosecond emitter coupled logic (ECL). In Task I, we have begun a conversion of the design rules, interconnection protocols, special components, and standard logic panels developed during the first year for high-speed ECL-based digital processors from a technology based upon dual-in-line packages (DIP) to a technology based upon specially designed leadless ceramic chip carriers. This conversion was undertaken since it was learned during the first year that the DIP packages themselves are compromising the maximum performance levels of which the ECL dice are capable. We have

also undertaken an extensive investigation of several possible approaches to increasing these operational maxima to an even greater extent than with our present design for new Leadless Ceramic Chip Carriers. Task 2 was to continue development of a comprehensive computer-aided design/computer-aided manufacturing (CAD/CAM) software package which would be specifically tailored to support the peculiar design requirements of processors operating in a high clock rate, transmission line environment. The CAD/CAM software package has been structured to be sufficiently flexible to assimilate advances in device and component technology, and to accept new sets of design rules resulting from advances in engineering design practice. GRA

N82-27653# California Univ., Los Angeles. Integrated Electromagnetic Lab.

ON THE EFFECT OF SUBSTRATE THICKNESS AND PERMITTIVITY ON PRINTED CIRCUIT DIPOLE PROPERTIES

P. B. Katehi and N. G. Alexopoulos Dec. 1981 35 p refs
(Contracts DAAG29-79-C-0050; N00014-79-C-0856)
(AD-A112607; UCLA-Eng-81-40; UCLA-2; ARO-15965.10-EL)
Avail: NTIS HC A03/MF A01 CSCL 09/5

The effect of substrate thickness and relative permittivity on the radiation properties of printed circuit dipoles (PCD's) is investigated. A trade-off between substrate thickness and resonant input resistance, bandwidth and radiation efficiency is presented for a PTFE glass random fiber substrate. It is found that for a fixed substrate thickness B, the resonant length and directivity decrease with increasing relative dielectric constant epsilon sub r. The E-plane normalized power pattern is also examined as a function of epsilon sub r and B. It is shown that even for very thin substrates, multiple beam radiation can result for certain values of epsilon sub r by the excitation of surface waves. Multiple beam patterns can also be obtained with increasing B for a given epsilon sub r. In fact, as B increases it is determined that the resonant length, bandwidth and resonant resistance approach the apparent value of a PCD on a dielectric half space.
Author (GRA)

N82-27654# Michigan Univ., Ann Arbor. Electron Physics Lab.

PROPERTIES OF HIGH-EFFICIENCY X-BAND GaAs IMPATT DIODES Interim Report, Sep. 1979 - Jan. 1981

R. K. Mains and G. I. Haddad Wright-Patterson AFB, Ohio AFWAL Jun. 1981 128 p refs
(Contract F33615-77-C-1132; AF Proj. 2002)
(AD-A107043; TR-147; AFWAL-TR-81-1066) Avail: NTIS HC A07/MF A01 CSCL 09/1

Several different IMPATT diode structures operating in the precollection mode at X-band (9 to 11 GHz) are examined, both using a complete finite-difference program and a simplified analysis which is developed in the report. The details of the precollection mode are examined, and large-signal solutions are presented for each different structure. Both single- and double-drift diodes are considered. Dynamic temperature effects are included and the differences between simulations at constant temperature and those with variable temperature are noted.
Author (GRA)

N82-27655# Wisconsin Univ., Madison. Dept. of Chemistry.

EFFECTS OF TEMPERATURE ON EXCITED-STATE DESCRIPTIONS OF LUMINESCENT PHOTOELECTROCHEMICAL CELLS EMPLOYING TELLURIUM-DOPED CADMIUM SULFIDE ELECTRODES

Arthur B. Ellis and Bradley R. Karas 6 Oct. 1981 15 p refs Submitted for publication
(Contract N00014-78-C-0633; NR Proj. 051-690)
(AD-A107544; TR-7) Avail: NTIS HC A02/MF A01

The effect of temperature on excited-state deactivation processes in a single-crystal, n-type, 100 ppm CdS:Te-based photoelectrochemical cell (PEC) employing aqueous polychalcogenide electrolytes is discussed. While serving as electrodes these materials emit: (lambda sub max is about 600 nm). Photocurrent (quantum yield Thi sub x) from ultraband gap (greater than or approx. = 2.4 eV; greater than or approx. = 500 nm) 501.7 nm excitation increases modestly by less than 20% between 20 degrees and is 100 C degrees; photocurrent from band gap edge 514.5 nm excitation increases by about an order of magnitude, reaching is approx. 50-100% of the room temperature 501.7 nm value. Highlighting the competitive nature of emission and photocurrent as excited -state decay processes, luminescence (quantum yield Thi sub R) declines over the same temperature regime by factors of between 10 and 30. At most, modest red shifts of Lambda sub Max (less than 10 nm) are observed in the spectral distribution of emission with temperature. These effects are discussed in terms of optical penetration depth, band bending, and the known red shift of the CdS absorption edge with temperature. Correlations involving Thi sub x and Thi sub r suggested by the data are discussed. GRA

N82-27656# Mitre Corp., Bedford, Mass. Government Electronics Div.

DOUBLY ROTATED CUT SAW DEVICES Final Report, 15 Aug. 1979 - 15 Aug. 1981

D. F. Williams and F. Y. Cho Jan. 1982 201 p refs
(Contract DAAK20-79-C-0275)
(AD-A110663; DELET-TR-79-0275-F) Avail: NTIS HC A10/MF A01 CSCL 09/2

The objective of this program is the exploratory development of doubly rotated cuts of quartz possessing superior Surface Acoustic Wave (SAW) properties for applications involving environmentally hardened devices. The key properties examined and optimized both theoretically and experimentally are: first, second and third order Temperature Coefficients of Delay (TCD), piezoelectric coupling factor, power flow angle, Bulk Acoustic Wave (BAW) inverse velocity surfaces, degeneracies and leaky waves, and sensitivities of the above quantities to misorientations and manufacturing tolerances. The program consists of two major task areas comprising an interactive numerical/experimental approach. Task I involves the numerical computation of the key SAW Properties for doubly rotated quartz substrates for the purpose of locating promising angular ranges with properties superior to the singly rotated cuts now in existence. GRA

N82-27657# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

AUTOMATIC MICROWAVE NETWORK ANALYZER CALIBRATION IN REFERENCE TO A TRANSMISSION LINE STANDARD WITH APPLICATIONS TO CHARACTERIZATION OF ADAPTERS, DEVICES AND COAXIAL LINES WITH SMA CONNECTORS Ph.D. Thesis

Joseph Peter DiBenedetto Oct. 1981 188 p refs
(AD-A107198; AFIT-CI-81-12D) Avail: NTIS HC A09/MF A01 CSCL 09/5

This dissertation describes the development of new techniques for calibrating a microwave automatic network analyzer (hereafter ANA) for complex reflection measurements. These techniques promise significant advantages for miniature connector systems. They include the use of an experimentally-derived characterization of an APC-7 open-circuit termination as a high-reflection calibration standard, adapter correction based on low dissipative losses, and a length of transmission line instead of a sliding load or fixed termination as a low-reflection standard. Gains afforded by these new techniques are reduced operator intervention during calibration, less wear of the measurement port connectors, lower equipment and maintenance costs, and calibrations referenced to standards truly relevant to the interconnecting transmission medium. Computer memory requirements are increased, but the cost of the increase is insignificant compared to the cost of microwave instrumentation. Slightly longer calibration times are offset by reduced demands upon operator skill. Methods of extending these calibration techniques to full two-port measurements will be discussed.
Author (GRA)

N82-27658# Boeing Military Airplane Development, Seattle, Wash. Mechanical/Electrical Systems Technology.

PROTECTION OF ADVANCED ELECTRICAL POWER SYSTEMS FROM ATMOSPHERIC ELECTROMAGNETIC HAZARDS Final Report, 15 Jun. 1979 - 15 Oct. 1981

David L. Sommer Wright-Patterson AFB, Ohio AFWAL Dec. 1981 233 p refs
(Contract F33615-79-C-2006; AF Proj. 3145)
(AD-A112612; D180-26154-2; AFWAL-TR-81-2117) Avail: NTIS HC A11/MF A01 CSCL 01/3

The effects of lightning strikes on aircraft and the resulting transients coupled onto the electrical systems were investigated. The historical background and overall scope of the study are presented. The lightning threat is defined and electrical system math models are developed. The normal design of aircraft for inherent hardness is evaluated. Wire routing, equipment location, fiber optics, threat level comparisons and the evaluation of specific electrical circuits are assessed. The effects of using add on protection to suppress induced transients on the electrical system are analyzed. Protection schemes include cable shielding, linear protection devices, nonlinear protection devices and conductive coatings applied to the aircraft skin. The design guide provides the most appropriate lightning hardening techniques is summarized. Reliability/maintainability, system safety and design to cost considerations are discussed. Protection criteria to develop a lightning tolerant electrical system are included. E.A.K.

N82-27659# Boeing Military Airplane Development, Seattle, Wash. Mechanical/Electrical Systems Technology.

PROTECTION OF ELECTRICAL SYSTEMS FROM EM HAZARDS: DESIGN GUIDE Interim Report, Jun. 1979 - Oct. 1981

David L. Sommer Wright-Patterson AFB, Ohio AFWAL Sep. 1981 211 p refs

(Contract F33615-79-C-2006)

(AD-A112707; D180-26154-3; AFWAL-TR-81-2118) Avail: NTIS HC A10/MF A01 CSCL 01/3

This report contains results of a two-phase study program investigating the effects of lightning strikes on aircraft and the resulting transients coupled on to the electrical systems. The design guide contains the historical background and the lighting threat assessment in the sections 1 and 2. Section 3 of the design guide contains the techniques for inherent hardening against the lightning strike electromagnetic energy. Section of 4 of the design guide provides two methods for evaluating electrical systems to determine the levels of transients that can be induced. The first method allows an electrical systems designer to make a preliminary assessment of the lightning strike threats. The second method allows a more detailed evaluation using a computer program called PRESTO. Section 5 identifies and examines the various military specifications covering the transients that existing electrical equipment has to withstand. Using this information, add-on protection hardware and hardening techniques were evaluated in Sections 6 and 7. Section 8 provides examples for selecting hardening techniques for advanced electrical systems. Sections 9, 10, and 11 discuss the reliability/maintainability, system safety and Design to Cost considerations in selection of the appropriate hardening techniques. Author (GRA)

N82-27660# Federal Aviation Administration, Atlantic City, N.J.

VERY HIGH FREQUENCY (VHF) MULTICOUPLER TESTS Final Report, Mar. - Apr. 1981

Albert J. Rehmann Feb. 1982 32 p refs

(FAA Proj. 219-151-200)

(AD-A112247; FAA-CT-81-62) Avail: NTIS HC A03/MF A01 CSCL 09/1

This report describes tests conducted on two commercially available very high frequency (VHF) multicouplers to determine if they could meet a set of proposed specifications. The multicouplers met all proposed specifications except the intermodulation distortion requirements. Author (GRA)

N82-27661# TRW Defense and Space Systems Group, Redondo Beach, Calif.

SURFACE ACOUSTIC WAVE MICROWAVE OSCILLATOR AND FREQUENCY SYNTHESIZER Final Report, 1 Oct. 1979 - 31 Mar. 1981

D. J. Dodson, M. Y. Huang, and M. D. Brunsman Sep. 1981 132 p

(Contract DAAB07-78-C-2992)

(AD-A107539; DELET-TR-78-2992-F) Avail: NTIS HC A07/MF A01 CSCL 09/5

A synthesizer design which, when packaged, provides a significant reduction in size, weight and power consumption as compared with current direct synthesis techniques was developed. The hardware implementation highlighted surface acoustic wave (SAW) device applications specifically geared toward addressing performance parameters such as switching speed, frequency step size, and total achievable bandwidth, as well as maximum suppression of spurious modes. Surface acoustic wave devices were incorporated as oscillators and delay lines/filters, together with monolithic large scale integrated circuits which work at RF frequencies (RF-LSI) as an iterative mix and divide architecture. A brassboard synthesizer fabricated and delivered. The brassboard unit is fully operational and was tested in order to characterize typical unit performance capabilities. The delivered synthesizer demonstrated outstanding switching speed, settling in less than 25 ns and provided an output whose phase noise was measured within the specified requirements, as measured to within 2 MHz of the carrier at an output frequency of 1308 MHz. Output spectral flatness was obtainable to within + or - 1.2 dB over the operational band, with achievable output power greater than +10 dBm. GRA

N82-27662# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.

ESTABLISHMENT OF PRODUCTION TECHNIQUES FOR TRANSDUCER ACOUSTIC DELAY LINES ON A PILOT LINE BASIS Final Report, Sep. 1977 - Apr. 1980

A. F. Zahorchak, R. A. Moore, R. N. Sundelin, J. B. Goodell, B. R. McAvoy, and H. L. Salvo, Jr. Adelphi, Md. HDL Jun. 1981 128 p

(Contract DAAB07-77-C-0569)

(AD-A107339; HDL-CR-81-569-1) Avail: NTIS HC A07/MF A01 CSCL 09/5

For about the past decade the development of microwave acoustic delay lines has seen few innovations. It is primarily for this reason that opportunities in the production of these lines leading to lower cost and improved performance was not realized. Such innovations include monolithic matching, mosaic transducers and an intensive investigation of processing steps and systems operation. All aspects of delay line design have been reexamined including media loss and anisotropy, transduction efficiency, diffraction and transducer film analysis. The net result of this effort is an essentially new approach to delay line design. This design lends itself well to batch fabrication processes with resulting cost reductions and performance improvement. Author (GRA)

N82-27663# McDonnell Aircraft Co., St. Louis, Mo. Lightning-Lab.

ASSESSMENT OF LIGHTNING SIMULATION TEST TECHNIQUES, PART 1 Final Report, Jul. 1980 - Oct. 1981

W. G. Butters, D. W. Clifford, K. P. Murphy, and K. S. Zeisel Oct. 1981 128 p refs Sponsored in part by Navy

(Contract F33615-80-C-3406; AF Proj. 2402)

(AD-A112626; AFWAL-TR-81-3075-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 14/2

The program objective was to assess the current pulse and shock-excitation lightning simulation test techniques. The current pulse test technique applies a pulsed current stimulus to the test article while the shock-excitation technique first charges the test article to a high voltage which then produces a rapid voltage/current pulse on the test article as the spark gap (between the test article and the return conductors) breaks down. Direct comparisons of the induced voltage response on interior circuits were made for the two test techniques. The interior circuits were high-impedance differential wire pairs typical of many flight-critical in advanced aircraft. The program was divided into three tasks: (1) an analytical task to model both test techniques to provide a theoretical base, (2) comparative tests using an aluminum cylinder and simple interior circuits that were readily modeled, and (3) comparative tests on the flight control circuits of a full-scale YF-16 fighter aircraft. The cylinder test configuration was modeled as two coupled transmission line circuits. The generator, cylinder, return lines, and the output configuration between the cylinder and the return line comprise the primary tranmission line that interacts with an interior circuit transmission line via aperture coupling. GRA

N82-27664# Naval Ship Research and Development Center, Bethesda, Md. Propulsion and Auxiliary Systems Dept.

ACTIVE SUPERCONDUCTIVE GENERATOR DEVELOPMENT 400 HORSEPOWER GENERATOR DESIGN

Howard O. Stevens and Michael J. Cannell Oct. 1981 119 p refs

(AD-A107513; DTNSRDC/PAS-81-14) Avail: NTIS

HC A06/MF A01 CSCL 10/2

A superconductive acyclic generator has been designed and constructed using the unique current-carrying capabilities of superconducting wire in the field winding to produce a very high flux density in the rotor region. This, along with the use of liquid-metal current collectors in lieu of conventional brushes has yielded a very high power density machine designed to operate at gas turbine speeds. The nominal 300-kilowatt generator is 0.66 meter long and 0.46 meter in diameter (26 x 18 inches) and is designed to operate at 19,500 revolutions per minute. Extrapolation of the design analyses indicates no barriers to operation up to 750 kilowatts. Efficiencies of 98% are estimated over the practical operating range. GRA

N82-27665# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELECTRONIC COMMUTATOR

L. A. Dubitskiy and Yu. I. Kuzmin 11 Mar. 1982 9 p Transl. into ENGLISH of Russian Patent no. 262958 (4 Feb. 1970) p 1-3

(AD-A113747; FTD-ID(RS)T-0166-82) Avail: NTIS HC A02/MF A01 CSCL 09/5

A high reliability electronic commutator containing a small number of active elements is described. The commutator contains a forbidden circuit having the source of the interrogation pulses attached to one input through a differentiating circuit and to the other input a source of pulsed power feed. The output is connected to the second input of each of the coincidence circuits. The commutator consists of n series connected groups, each containing a pulse potential coincidence circuit, a storage capacitor, and an amplifier limiter the output of which is connected to one input of the coincidence circuit. J.D.

N82-27666# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PHASE-PULSE MULTISTABLE COUNTING CIRCUIT

L. A. Dubitskiy 10 Mar. 1982 8 p Transl. into ENGLISH of Russian Patent no. 314312 (7 Sep. 1971) p 1-2

(AD-A113746; FTD-ID(RS)T-0185-82) Avail: NTIS HC A02/MF A01 CSCL 09/5

This device is intended for counting the number of pulses and the division of the pulse repetition frequency. It is used in particular in electronic counting frequency meters. Phase pulsed multistable counting circuits containing a storage capacitor and a self-tuning capacitor have wide application. The described device makes it possible to expand the range of measurements of the comparison voltage, and to raise the operational reliability of the device. S.L.

N82-27667# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A DEVICE FOR AUTOMATIC TUNING OF CONTROL SYSTEMS

B. V. Novoselov and A. A. Kobzev 18 Mar. 1982 10 p Transl. into ENGLISH of Russian Patent no. 297032 (2 Mar. 1971) p 1-4

(AD-A113745; FTD-ID(RS)T-0066-82) Avail: NTIS HC A02/MF A01 CSCL 09/5

A device for the automatic tuning of control systems, containing two amplifiers connected to the servomotors and the comparison circuits is described. The device is provided with two squaring devices connected to the output of its comparison circuit, an adder whose inputs are connected to the outputs of both squaring devices, two relay units, and two units connected to the output of the system. One of these units measures frequency and the other measures frequency and the other measures and registers amplitude. The output of the first is connected via the corresponding comparison circuit and one of the relay units to the servomotor for adjusting the amplification factor and the output of the second one is connected via its comparison circuit and the second relay unit to the servomotor for adjusting the rate feedback transmission factor. The outputs of the adder are connected to the inputs of both amplifiers. J.D.

N82-27668# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PULSE REPETITION FREQUENCY DIVIDER

L. A. Dubitskiy and Ye. M. Sheremet 10 Mar. 1982 10 p Transl. into ENGLISH of Russian Patent No. 202216 (14 Sep. 1967) 3 p

(AD-A113732; FTD-ID(RS)T-0165-82) Avail: NTIS HC A02/MF A01 CSCL 09/5

A device consisting of a driven multivibrator with collector base connections and an emitter follower in the discharge order to raise the maximum frequency of input pulses and to expand the limits of change of the duration and on-off time ratio of the output pulses, a stabilitron is connected in series with the discharge resistor of the time setting capacitor. The cathode of the stabilitron is connected with a plate of the capacitor and the base of the normally closed transistor. A voltage divider made up of two resistors having the cathode of the diode connected to the common point of the resistors and the anode of the diode connected to the collector of the normally closed transistor is also connected to the collector of the transistor. J.D.

N82-27669# Hull Corp., Hatboro, Pa. Thinco Div.

THIN FILM MONOLITHIC BYPASS FILTERS Final Report

Stephen T. Chen 30 Nov. 1981 36 p

(Contract N62269-80-C-0024)

(AD-A114059; NADC-79271-40) Avail: NTIS HC A03/MF A01 CSCL 09/5

Monolithic Thin Film Bypass Filters consisting of one inductor and one capacitor have been fabricated using vacuum deposition techniques. The inductor and the capacitor are formed at the same time by depositing alternate layers of metal and dielectric materials. The inductor and the capacitor are interconnected to form a three terminal device. Two sizes of Bypass Filters, designated as LC-55 and LC-100 having inductance value ranging from 35 to 1,100 nanohenries and capacitance value ranging from 11.5 to 510 picofarads have been constructed. It has been shown that the values of inductance and capacitance of a Bypass Filter can be varied almost independently by changing the thickness of the dielectric deposited. Measurements of the electrical parameters of the inductor and the capacitor individually as well as the frequency characteristics of the device functioning as a Lowpass or Highpass filter have been conducted. GRA

N82-27670# Syracuse Univ., N. Y.

MICROCIRCUIT PACKAGE STRESS ANALYSIS Final Technical Report, 10 Apr. 1980 - 9 Aug. 1981

Charles Libove, Richard W. Perkins, and Klod Kokini Griffiss AFB, N.Y. RADC Jan. 1982 362 p refs

(Contract F30602-80-C-0155; AF Proj. 2306)

(AD-A113594; MAE-1237-F1; RADC-TR-81-382) Avail: NTIS HC A16/MF A01 CSCL 09/5

The response of various package components to various stressful environments is studied. The environments selected are among those that the package might experience in the course of mechanical screening by the methods of MIL-STD-883 ('Test Methods and Procedures for Microelectronics') or they are approximations and idealizations of conditions that the package might encounter in the field. Specifically, the following environments are considered: external pressure, constant acceleration, impact, sinusoidal vibration, and thermal shock. One or more chapters of the present report are devoted to each environment. The package types that are addressed in this study are generally those that can be described as flat and rectangular (which includes square). Thus, flatpacks and dual-in-line packages are included. The broad objective of this work is to direct attention, for each environment, to those package areas that are most directly affected by that environment, and to show, by means of analysis, what the major effects might be, in terms of stress and deformation. GRA

N82-27671# Virginia Univ., Charlottesville. Dept. of Materials Science.

DESIGN AND TESTING OF HIGH PERFORMANCE BRUSHES Final Report, 1 Jul. 1976 - 31 Jan. 1982

Doris Kuhlmann-Wilsdorf Mar. 1982 51 p

(Contract N00014-76-C-1009)

(AD-A113735; UVA/525324/MS82/104) Avail: NTIS HC A04/MF A01 CSCL 20/3

A new breed of electrical brush, i.e., unlubricated flexible metal brushes, has been developed. Of these, two specific types, namely metal fiber brushes and metal foil brushes, have been constructed and tested, and theory has been developed which

accounts for their behavior, based on Holm's theory of electrical contacts. It has been shown that electrical tunneling makes a significant contribution to current conduction in fiber brushes, outside of the areas needed for bearing the brush force. Correspondingly brush resistance is reduced, the more so the finer the fibers are, and brush performance was found to be very superior. Some of these developments plus a number of other novel designs of unlubricated flexible metal brushes have given rise to two extensive patent applications. The most promising of those latter designs have not yet been reduced to practice but they should go far to eliminate most, and perhaps all, of remaining shortcomings of electrical brushes. In addition, some theoretical research in other areas of ancillary interest to brush behavior has been conducted, most of it in metal fatigue. GRA

N82-27672# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM&T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Oct. - 31 Dec. 1981
F. M. Bruno 31 Jan. 1982 16 p
(Contract DAAK70-80-C-0168)
(AD-A114024; TEI-A009-5; QR-5) Avail: NTIS HC A02/MF A01 CSCL 09/1

The two CRT assemblies for the 2nd Submission of Phase I - Engineering Samples were successfully fabricated, acceptance-tested, and delivered to NV&EOL. TEI proposed a revision to its PERT Chart to allow sufficient time for the engineering and reliability testing stipulated by MM&T H799838 for Phase II and Phase III of the project. Rhw COR believed that TEI's projected revisions in the completion data could jeopardize the Army's schedule for the Advanced Attack Helicopter (AAH) and, therefore, joint efforts and adjustments are in progress to shorten the proposed production and testing schedule by four months.
Author (GRA)

N82-27673# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM&T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Jul. - 30 Sep. 1981
F. M. Bruno 30 Oct. 1981 16 p
(Contract DAAK70-80-C-0168)
(AD-A114023; TEI-A009-4; QR-4) Avail: NTIS HC A02/MF A01 CSCL 09/1

Design problems that caused delays in the 2nd Submission of two (2) Phase I - Engineering Samples were resolved. Contract due dates required rescheduling and a revised PERT Chart will be sent to the COR. The acquisition of a specialized video amplifier from the EM will provide for the performance of all operational tests in accordance with the MM&T requirements. This equipment will establish a correlation point for recorded data on the direct measurements of CRT image quality. Author (GRA)

N82-27674# Varian Associates, Palo Alto, Calif. Solid State Lab.
ADVANCED SUBMICRON FETS Semiannual Report, May - Oct. 1981
S. Bandy, C. Nishimoto, G. Zdasinuk, and C. Hooper Mar. 1982 26 p refs
(Contract N00014-81-C-0270; NR Proj. 251-049)
(AD-A113789) Avail: NTIS HC A03/MF A01 CSCL 09/1

Replacing the mushroom gate profile with a better collimated evaporation has resulted in FETs with equivalent performance. Balanced FETs have been fabricated with equivalent dc performance to their unbalanced counterparts, but with inferior RF performance. Author (GRA)

N82-27675# Edgerton, Germeshausen and Grier, Inc., Salem, Mass. Electronics Components Div.
NANOSECOND PULSER THYRATRONS Interim Report, 15 Jan. - 30 Jul. 1981
Steven Friedman Ft. Monmouth, N.J. Army Electronics Research and Development Command Jan. 1982 44 p
(Contract DAAK20-80-C-0282; DA Proj. 1L1-62705-AH-94)
(AD-A114046; DELET-TR-80-0282-2; IR-2) Avail: NTIS HC A03/MF A01 CSCL 09/1

The fundamental feasibility of using thyratrons for 1 ns turn-on of certain millimeter wave devices has been demonstrated, in that a voltage rise rate of 6kv/ns has been achieved across a pure approximately 60 pF load. Use of ferrite bead saturable reactors enabled this to be accomplished at a thyratron pressure compatible with both reliable voltage holdoff and sufficiently short recovery time for a 20 kHz prr. The thyratron used was a 3-inch diameter HY-3013 modified for low inductance and designated HY-3013L. In particular this result shows that HY-3013L will meet the recently reduced EIO triggering requirements (< or approx. 3 kv), even though the ratio of load voltage to thyratron voltage will decrease to only 0.5-1.0 when the pulse width is reduced to 4 ns FWHM. (The exact value of this ratio will depend on the type of circuit employed). Operation at higher voltages will require a several-fold decrease in thyratron recovery time. Substantial reduction in thyratron jitter is also needed, and a reduction in the power required to trigger the thyratron would be desirable. Thyratrons based on the HY-3013L, but modified to achieve these goals, are being designed.
Author (GRA)

N82-27676# Edgerton, Germeshausen and Grier, Inc., Salem, Mass.
NANOSECOND PULSER THYRATRONS Interim Report, 10 Jul. - 10 Dec. 1980
Steven Friedman Ft. Monmouth, N.J. Army Electronics Research and Development Command Jan. 1982 36 p refs
(Contract DAAK20-80-C-0282; DA Proj. 1L1-62705-AH-94)
(AD-A114045; DELET-TR-80-0282-1; IR-1) Avail: NTIS HC A03/MF A01 CSCL 09/1

A thyratron is constructed capable of meeting the Type II requirements for voltage, peak current and average power, and has characterized its resistive fall time, recovery time, and forward voltage holdoff as functions of pressure and triggering configuration. A low inductance circuit has been built, incorporating the thyratron, a 5 nF fast discharge capacitor, and a 60 pF capacitor to simulate the loading effect of a magnetron or EIO. A theoretical model for the circuit which includes the effects of thyratron resistance (time varying), and inductance was developed. The resistive fall time decreases with rising pressure, but more slowly than predicted by gas breakdown theory, suggesting that it is being limited by the internal design of the thyratron. Fall times of only around 3 ns are obtainable before the pressure gets too high, (0.9 torr), for the 50 microns s recovery time required for 20 kHz operation. This will necessitate experimentation with ferrites to delay the current rise until the anode fall is over. Electrode design modifications to decrease the fall and recovery times will also be tested. The 6 kv forward holdoff required under Type II conditions has been attained at pressures up to 1.3 torr by use of a fast pulse charging. GRA

N82-27677# Stanford Univ., Calif. Lab. of Physics.
ACOUSTICAL SCANNING OF OPTICAL IMAGES Semiannual Technical Report, 1 Jul. - 31 Dec. 1981
G. S. Kino, B. T. Khuri-Yakub, J. E. Bowers, and R. Thornton Jan. 1982 38 p refs
(Contract N00014-76-C-0129; DARPA Order 2778; NR Proj. 243-034)
(AD-A113512; SU-GL-3378; ONR-CR-243-034-13; TR-13) Avail: NTIS HC A03/MF A01 CSCL 09/2

The parallel research efforts of high barrier height Schottky diodes and Sezawa wave storage correlators have been integrated and storage has been demonstrated with 1 ns pulses. Storage times in storage correlators of 400 seconds have been demonstrated by cooling to -75 C. The initial experiments in flaw discrimination indicate the possibility of discriminating between different size voids, and discriminating between filled and unfilled holes. Broadband (42%) active matching circuits have been implemented and a design is investigated for making active matching circuits without the use of any indicators.
Author (GRA)

N82-27678# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering.
WIDEBAND MONOLITHIC MICROWAVE AMPLIFIER STUDY Annual Technical Report, Jul. 1980 - Aug. 1981
J. B. Beyer, R. C. Becker, and J. E. Nordman Aug. 1981 42 p refs
(Contract N00014-80-C-0923; RR0210203)
(AD-A112976; ECE-81-11) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report discusses distributed amplifier theory in the context of the microwave monolithic GaAs circuit. It is shown that GaAs FET devices dictate that both the input and output transmission lines become lossy which places fundamental limitations on the distributed amplifier concept and results in different constraints than are found in lossless distributed amplifier design. First order theory indicates that gain asymptotically approaches an upper bound and little benefit results from increasing the number of devices beyond certain limits. Author (GRA)

N82-27679# Rockwell International Corp., Downey, Calif. Satellite Systems Div.
SOLID-STATE MILLIMETER-WAVE SOURCE STUDY: A STUDY OF TWO NOVEL CONCEPTS FOR GENERATION OF CW MILLIMETER WAVES Final Report, Jul. 1979 - Oct. 1981
Jack Soohoo Sep. 1981 65 p refs
(Contract DAAK70-79-C-0043; DA Proj. 1L1-61102-A-31B)
(AD-A113460; C79-606-12/501) Avail: NTIS HC A04/MF A01 CSCL 09/5

Two novel device concepts for generating CW millimeter waves with output power in the multi-watt range were investigated. The first concept involves the utilization of modulated lasser radiation to induce in a distributed Schottky diode structure a travelling-wave current which, in turn, synchronously excites the dominant mode of a waveguide structure to generate millimeter power. The induced travelling-wave current is directly proportional to the laser modulation generated by the interference of two overlapping laser beams of millimeter beat frequency. Experimentally, we have thus far demonstrated this concept of millimeter wave generation using a point-like Hg/CdTe diode/waveguide structure. The second concept involves the use of a distributed IMPATT diode/waveguide structure. This structure is battery-operated and requires no optical excitation, simply an elongated Read-type diode in the gap of a specially designed ridgeguide. In this structure, the field-current interaction is very strong, resulting in a growing travelling wave which extracts energy from the DC bias. Author (GRA)

N82-27680# Varian Associates, Palo Alto, Calif.
BASIC IMPROVEMENTS IN SUBSTRATE InP MATERIAL Final Report, 1 Jan. 1979 - 15 Jan. 1982
S. B. Hyder 15 Jan. 1982 42 p refs
(Contract DAAG29-79-C-0009)
(AD-A113237; ARO-16041.3-EL) Avail: NTIS HC A03/MF A01 CSCL 09/1

Different methods for the synthesis of Indium Phosphide were devised and growths evaluated for photoluminescence, mobility, carrier concentration, and resistivity. Single crystals of InP were grown doped with Fe, Cr, Zn, and S and evaluated by photoluminescence, van der Pauw analysis and X-ray topography. Author (GRA)

N82-27681# California Univ., Livermore. Lawrence Livermore Lab.
MASTERSLICE TECHNOLOGY STUDY Final Report
J. W. Balch 31 Aug. 1981 45 p refs
(Contract W-7405-eng-48)
(UCID-19182) Avail: NTIS HC A03/MF A01

Masterslices integrated circuit (IC) technology which provides a means for custom IC development by the end user of the IC, involves customizing the final metal layer used to interconnect components already processed on a standard wafer. This technology provides rapid turnaround times and low development costs for small quantities of custom ICs. In addition, the design of these ICs can be done by a wide variety of circuit design engineers using conventional analog and digital circuit functions. The results of a survey of several applications for these custom ICs are presented. The environment and facilities needed for their development are dicussed. DOE

N82-27682# National Bureau of Standards, Washington, D.C.
DECONVOLUTION OF TIME DOMAIN WAVEFORMS IN THE PRESENCE OF NOISE
Norris S. Nahman and M. E. Guillaume Oct. 1981 125 p refs
(PB82-135153; NBS-TN-1047) Avail: NTIS HC A06/MF A01 CSCL 09D

Deconvolution of inverse filtering was used to determine the impulse response of a system using noisy input and output time domain sequences (discrete data). Frequency and time domain methods were studied along with the synthesis of the filters required to obtain stable and smooth results. For the methods studied, it was concluded that the superior technique was provided by an optimal frequency domain method implemented via the FFT. Also, it is pointed out that the time domain methods are only in their infancy and still retain the promise of avoiding transform domain filtering. Examples are presented in which the impulse responses are determined in the presence of varying degrees of noise for a coaxial transmission line, a wave shaping filter, and a broadband antenna. GRA

N82-27683# Scottish Research Reactor Centre, East Kilbride.
A FLEXIBLE MULTI-SCALER SYSTEM WITH MICROPROCESSOR CONTROL
J. Scobie and M. Flynn 1981 10 p
(PB82-155516; SURRC-63/78) Avail: NTIS HC A02/MF A01 CSCL 09E

A multiscaler system of small bulk, high degree of flexibility and low cost, based on a microprocessor kit and LS1 counter chips is described. GRA

N82-27684# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
BALUN LINE: MICROSTRIP RELEASE
Lucio Baptista Trannin Cividanes May 1981 16 p refs Transl. into ENGLISH of the mono. "Balun Faixa-Larga em Linha de Fita" Sao Jose, Brazil, May 1981 16 p
(PB82-162884; INPE-2072-NTE/172) Avail: NTIS HC A02/MF A01 CSCL 09A

The theory and design of a tapered balun transformer which functions over a wide frequency range is presented. The balun is an impedance match transition from a microstrip line to a balanced line, formed by two strips of equal width, one strip on each side of the dielectric sheet. Measurements on a test balun show a good preformance both in voltage standing wave ratio and in insertion loss. For its inherent ease of construction and good reproducibility, this type of balun can be utilized in a great number of applications, including the construction of balanced mixes and the excitation of antennas. GRA

N82-27404*# Massachusetts Inst. of Tech., Cambridge.
ELECTRONICS MATERIALS RESEARCH
In its The Mater. Process Res. Base of the Mater. Process. Center 28 Jun. 1982 p 23-46 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N82-27685# National Mechanical Engineering Research Inst., Pretoria (South Africa). Fluid Mechanics Div.
HYDRAULIC TRANSPORT OF COARSE SOLIDS IN CIRCULAR AND SEGMENTED PIPES
H. B. Sauermann May 1981 165 p refs
(CSIR-ME-1716; ISBN-0-7988-1479-9) Avail: NTIS HC A08/MF A01

A detailed investigation into the hydraulic transport of coarse solids in circular and segmented pipes is presented. The existing hydraulic transport pipelines carry relatively fine solids. It is believed that if coarse solids could be transported economically, many more hydraulic transport pipelines would come into operation. It is shown that by providing a wide bed, e.g., a base wear plate in a circular pipe (segmented pipe) to the sliding bed of coarse particles, the energy requirements for the same solids throughout in comparison with a circular pipe of the same diameter is, depending upon the position of the base wear plate and the solid material, reduced by up to 35%. Author

N82-27686*# Pennsylvania State Univ., University Park. Turbomachinery Lab.

THREE DIMENSIONAL FLOW FIELD INSIDE COMPRESSOR ROTOR, INCLUDING BLADE BOUNDARY LAYERS Semiannual Progress Report

J. M. Galmes, M. Pouagere, and B. Lakshminarayana Jun. 1982 78 p refs

(Grant NsG-3266)

(NASA-CR-169120; NAS 1.26:169120; PSU/Turbo-82-4) Avail: NTIS HC A03/MF A01 CSCL 20D

The Reynolds stress equation, pressure strain correlation, and dissipative terms and diffusion are discussed in relation to turbulence modelling using the Reynolds stress model. Algebraic modeling of Reynolds stresses and calculation of the boundary layer over an axial cylinder are examined with regards to the kinetic energy model for turbulence modelling. The numerical analysis of blade and hub wall boundary layers, and an experimental study of rotor blade boundary layer in an axial flow compressor rotor are discussed. The Patankar-Spalding numerical method for two dimensional boundary layers is included. A.R.H.

N82-27687*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

COMPARISON OF VISCOUS-SHOCK-LAYER SOLUTIONS BY TIME-ASYMPTOTIC AND STEADY-STATE METHODS

R. N. Gupta, J. N. Moss, and A. L. Simmonds May 1982 31 p refs Submitted for publication

(NASA-TM-84479; NAS 1.15:84479) Avail: NTIS HC A03/MF A01 CSCL 20D

Two flow-field codes employing the time- and space-marching numerical techniques were evaluated. Both methods were used to analyze the flow field around a massively blown Jupiter entry probe under perfect-gas conditions. In order to obtain a direct point-by-point comparison, the computations were made by using identical grids and turbulence models. For the same degree of accuracy, the space-marching scheme takes much less time as compared to the time-marching method and would appear to provide accurate results for the problems with nonequilibrium chemistry, free from the effect of local differences in time on the final solution which is inherent in time-marching methods. With the time-marching method, however, the solutions are obtainable for the realistic entry probe shapes with massive or uniform surface blowing rates; whereas, with the space-marching technique, it is difficult to obtain converged solutions for such flow conditions. The choice of the numerical method is, therefore, problem dependent. Both methods give equally good results for the cases where results are compared with experimental data. A.R.H.

N82-27688*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TOPOLOGICAL ANALYSIS OF COMPUTED THREE-DIMENSIONAL VISCOUS FLOW FIELDS

George S. Deiwert Jun. 1982 13 p refs

(NASA-TM-84255; A-8968; NAS 1.15:84255) Avail: NTIS HC A02/MF A01 CSCL 20D

Computed solutions of the time-dependent, Reynolds-averaged Navier-Stokes equations for three dimensional flows having thin shear layers are analyzed using topological concepts. Specific examples include the transonic flow over a body of revolution with conical afterbody at moderate angles of incidence to the free stream. Experimental flow-visualization techniques are simulated graphically to visualize the computed flow. Scalar and vector fluid dynamics properties such as pressure, shear stress, and vorticity on the body surface are presented as topological maps, and their relationship to one another in terms of orientation and singular points is discussed. The extrapolation from these surface topologies toward the understanding of external flow-field behavior is and demonstrated. Author

N82-27689# Florida Univ., Gainesville. Dept. of Engineering Sciences.

A FINITE ELEMENT-DIFFERENTIAL METHOD FOR INCOMPRESSIBLE TURBULENT BOUNDARY-LAYER FLOWS Ph.D. Thesis Interim Report, Jan. 1980 - Aug. 1981

Tyne-Hsien Chang and Chen-Chi Hsu Wright-Patterson AFB, Ohio AFWAL Feb. 1982 86 p refs

(Contract F33615-81-K-3210 ; Grant AF-AFOSR-0033-80; AF Proj. 2304)

(AD-A112821; AFWAL-TR-81-3174) Avail: NTIS HC A05/MF A01 CSCL 21/1

The applicability as well as the accuracy and efficiency of a finite element-differential method, which had been shown to be a very effective method for laminar flows, is investigated in detail for more complex steady two-dimensional incompressible turbulent boundary layer flow problems. The closure model chosen for the turbulent flows is a two-layer eddy viscosity model. A number of important transformations have been carried out for the system of governing equations before the application of the proposed solution method. In the method of solution, the transformed partial differential equation is first reduced to a system of first order nonlinear ordinary differential equations by a subdomain collocation method, in which the unknown function at a streamwise station is represented by a classical spline function. The resulting initial value problem is then integrated numerically by the modified Hamming's predictor-corrector method as well as by Gear's method for stiff equations. The numerical experiments have been conducted on the flat plate problem which consists of the laminar, transitional, and turbulent flow regions covering the range of local Reynolds numbers from 800 to 800 million. The study shows that the method of solution can be very efficient and provides highly accurate results for the turbulent flow problem. GRA

N82-27690# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.

BOILING HEAT TRANSFER IN CONFINED SPACE Annual Technical Report, 1 Aug. 1980 - 1 Aug. 1981

Shi-Chune Yao Oct. 1981 105 p refs

(Contract N00014-79-C-0623; RR0240302)

(AD-A107363) Avail: NTIS HC A06/MF A01 CSCL 20/13

In many equipments, boiling occurs in confined space such as the clearance between the tube and the support plate of steam generators. Corrosive concentration builds up at the boundary of dryout zone and induces severe damage. The knowledge on this kind of boiling phenomena is very limited. It is the objective of this research to understand this fundamental heat transfer of this problem through systematical analysis and experimental studies. This report covers the following aspects of the boiling in confined space: (1) Analysis of single phase forced convection in support plate crevices; (2) Analysis of convective boiling and dryout in support plate crevices; (3) Experiments of boiling and dryout in annular crevices with closed bottom; and (4) Experiments of convective boiling and dryout in annular crevices. Author (GRA)

N82-27691# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

TRANSIENT ANALYSIS OF HEAT TRANSMISSION SYSTEMS

Gary E. Phetteplace Dec. 1981 63 p refs

(DA Proj. 4A7-62730-AT-42)

(AD-A112365; CRREL-81-24) Avail: NTIS HC A04/MF A01 CSCL 20/13

This report develops a method of analysis for heat transmission systems operating under district heating load conditions. The method accounts for the effects of heat source and load characteristics. The use of thermal energy storage systems is outlined and advantages are given. The transmission model itself considers the following technical aspects: (1) frictional pressure losses in piping system, (2) pump characteristics, (3) pump driver characteristics, and (4) heat losses from the buried piping. The capital costs considered are the piping system and necessary pumps. Operation and maintenance costs include cost of heat loss and cost of pumping energy input. Allowances are also made for system maintenance and repair over the assumed lifetime. GRA

N82-27692# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

APPLICATION OF THE HEAT BALANCE INTEGRAL TO CONDUCTION PHASE CHANGE PROBLEMS

Virgil J. Lunardini Dec. 1981 23 p refs

(DA Proj. 4A1-61109-A-91D)

(AD-A112813; CRREL-81-25) Avail: NTIS HC A02/MF A01 CSCL 20/13

The problem of heat conduction with phase change, often called the Stefan problem includes some of the most intractable mathematical areas of heat transfer. Exact solutions are extremely limited and approximate methods are widely used. This report discusses the collocation method for the heat balance integral approximation. The method is applied to some standard problems of phase change, Neumann's problem, and a new solution is presented for the case of surface convection for a semiinfinite body. Numerical results are given for soil systems and also for materials of interest in latent heat thermal storage.

Author (GRA)

N82-27693# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

PERFORMANCE OF AN OSWATISCH INLET WITH HEMISPHERICAL CENTERBODY AT ZERO ANGLE OF ATTACK M.S. Thesis

John Francis Moran Jun. 1981 87 p refs
(ARPA Order 4035)
(AD-A107439; NPS67-81-009) Avail: NTIS HC A05/MF A01 CSCL 21/5

This thesis analyzes the performance of a ramjet with an Oswatisch inlet using a blunt centerbody and compares performance to a baseline ramjet using an inlet with a conical spike at Mach 3.0. Inlet performance as a ratio of inlet tip to nose centerbody ratio, r sub L/r sub n, is developed. The capture streamline for each ratio is determined and the coefficient of additive drag is calculated as a function of r sub L/r sub n. Setting thrust coefficient equal to coefficient of drag, the performance of two ramjets is determined. One ramjet is the baseline with a spike inlet; the other ramjet uses the blunt centerbody. Ramjets and inlets are compared on the basis of specific fuel consumption, excess thrust coefficient and specific thrust. For the ramjet with blunt centerbody, performance parameters were calculated as a function of inlet lip radius to nose centerbody radius. Also compared is the effect of the ratio, r sub L/r sub n, on relative detection range. For both types of ramjets, the detection range is reduced by approximately 66%. Performance of the ramjet with blunt nosed centerbody is severly handicapped due to high additive drag and poor pressure recovery. Specific fuel consumption is approximately 50% greater for the ramjet with the blunt centerbody compared to the ramjet with the spike inlet. Author (GRA)

N82-27694# Naval Postgraduate School, Monterey, Calif.

DESIGN MODEL FOR THE HEAT TRANSFER IN A SHORT STRAIGHT TUBE BOILER M.S. Thesis

Leo W. Vollmer, Jr. Jun. 1981 182 p refs
(AD-A107454) Avail: NTIS HC A09/MF A01 CSCL 13/10

A design model for the Short Straight Tube Boiler with a segmented fin-tube arrangement was developed. This model was integrated for a single tube applied in a computer program written in BASIC for the Hewlett Packard 9845 model B desk-top computer. Water-side Reynolds numbers were varied in order to investigate the performance of this boiler. For an overall tube length of 39.4 inches, a Reynolds number of 840 (29.65 lbm/hr) resulted in obtaining 50 deg superheat for an operating pressure of 600 psig. With these conditions, saturated boiling begins at 11.45 inches and superheating at 21.88 along the tube length.

Author (GRA)

N82-27695# Naval Research Lab., Washington, D. C. Optical Radiation Branch.

ATMOSPHERIC TURBULENCE AS A FUNCTION OF HEIGHT ABOVE VARIOUS SURFACE MATERIALS Interim Report

Daniel H. Garcia 23 Sep. 1981 23 p refs
(AD-A107034; NRL-8518) Avail: NTIS HC A02/MF A01 CSCL 20/4

The atmospheric refractive-index structure parameter C 2 sub n was determined at heights 0.5 to 5 meters above open-field grass, blacktop, concrete, and aluminized-Mylar sheets attached to plywood. Measurements were made of the temperature structure parameter with twin fast-response, temperature-sensing probes made of 2-micrometer diameter platinum wire which were separated 10 cm and optimally excited at 10 microwatts. The RMS value of the temperature difference between the probes was determined with R. W. Harris double-AC bridge/log-meter system. Probe height was changed approximately every 30 minutes. The differential temperature and the meteorological parameters comprising air temperature, dew point, wind speed and direction, solar insolation and barometric pressure were sampled at 1-second intervals. Results indicate a height dependence of the form C 2 sub n = KH to the minus M, where K is a function of the surface (0.84 < or = K/10 to the minus 13th power m to the minus 2/3 power < or = 1.8) and M = - 1.2 + or - 0.5, with the wide variation in M due to changing meteorological conditions, most importantly solar insolation and wind speed. In this experiment, no significant differences in average value of C 2 sub n could be determined for the four surfaces. Additionally, the anticipated reduction in turbulence over aluminized Mylar was not observed. GRA

N82-27696# Naval Research Lab., Washington, D. C. Physical Oceanography Branch.

HIGH SOLITARY WAVES IN WATER: RESULTS OF CALCULATIONS

James M. Witting 30 Sep. 1981 20 p refs
(AD-A107267; NRL-8505) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report presents results of calculations of certain properties of solitary waves in water as a function of wave strength, with emphasis on the highest and other high waves. A preceding report outlines the method used to arrive at the results presented here. The method involves a Fourier series solution of the flow field at various (numerical) resolutions to arrive at an estimate of limits as the resolution becomes infinitesimal. Values of the properties of intermediate and high waves possess 4 to 6 significant figure accuracies. For some solitary wave parameters, the calculations agree well with those found using independent methods and verify that the total energy and other integral properties reach a maximum at strengths less than that of the highest wave. They also verify that the maximum angle of surface inclination can exceed 30 deg. for the not-quite-highest waves. In addition, this report gives solitary wave properties useful in constructing periodic wave solutions by the superimposition of solitary waves. The highest wave in water is higher than previously reported; its amplitude to depth ratio is 0.8332. Author (GRA)

N82-27697# Pennsylvania State Univ., University Park. Applied Research Lab.

COMPARISON OF PARABOLIZED VORTICITY AND NAVIER-STOKES SOLUTIONS IN A MILDLY NONORTHOGONAL COORDINATE SYSTEM

G. H. Hoffman 17 Feb. 1982 34 p refs
(Contract N00024-79-C-6043)
(AD-A113912; ARL/PSU/TM-82-72) Avail: NTIS HC A03/MF A01 CSCL 20/4

Two-dimensional, steady, incompressible, laminar flow in a diffuser and nozzle is considered as a model problem. A sheared mapping is used to provide a rectangular, wall-fitted, computational domain. This transformation produces a mildly nonorthogonal coordinate system in which the Navier-Stokes equations and parabolized vorticity approximation are solved. The discretization uses fourth-order accurate polynomial splines to resolve the wall boundary layer with a relatively sparse grid and standard finite differences in the main stream direction. The spline-finite difference equations are solved by line relaxation and Newton-Raphson iteration. Comparison of Navier-Stokes and parabolized vorticity results are presented for two diffusers (both with separation and reattachment of the boundary layer) and one nozzle flow. The parabolized and Navier-Stokes solutions are found to be in excellent agreement. Comparisons with a published parabolized result are also given. Author (GRA)

N82-27698# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.

HIGH PRESSURE ATOMIZATION Final Report, 1 Jun. 1976 - 31 May 1981

F. V. Bracco Mar. 1982 264 p refs
(Grants DAAG29-76-G-0264; DAAG29-77-G-0146; DAAG29-78-G-0132)
(AD-A113892; ARO-13935.3-EX) Avail: NTIS HC A12/MF A01 CSCL 21/7

The main objective of these grants has been to study the fundamental processes which lead to the atomization of high pressure jets injected into compressed gases through single hole

nozzles. Specific topics include: Dependence of Spray Angle and Other Spray Parameters on Nozzle Design and Operating Conditions; Ultra High Speed Filming of Atomizing Jets; Mechanism of Breakup of Highly Super Heated Liquid Jets; Measurements of the Spray Angle of Atomizing Jets; Mechanism of Atomization of a Liquid Jet; Scaling of Transient Laminar, Turbulent, and Spray Jets; Computations of Drop Sizes in Pulsating Sprays and of Liquid Core Length in Vaporizing Sprays; and Scaling of Impulsively Started Sprays. GRA

N82-27699# Vought Corp. Advanced Technology Center, Inc., Dallas, Tex.

HYDRODYNAMIC DRAG MEASUREMENTS ON COMPLIANT SURFACE DISKS

T. D. Reed and G. R. Hough Oct. 1978 34 p refs
(Contract N00014-77-C-0133)
(AD-A112966; ATC-B-9100/8CR-77) Avail: NTIS HC A03/MF A01 CSCL 20/4

The rotational drag of a disk, with interchangeable faces of compliant membrane/substrate combinations, has been measured in a water tank. A device for stretching a membrane uniformly and with repeatable results was designed, built, and successfully employed. The test procedure was selected as a simple means of screening potential drag reducing compliant surfaces as suggested by previous experimental and analytical studies. Nearly 40 different disks were tested in turbulent flow over a Reynolds number range of 1.7 - 3 million. Membrane thickness and tension, as well as substrate thickness, was varied. The membranes were bonded, unbonded, and separated by an air gap with respect to the substrates. The measured drag was compared to that of a corresponding hard reference disk. In most cases, no drag reduction occurred. The few measured drag reductions were within the estimated experimental inaccuracy. GRA

N82-27700# Bettis Atomic Power Lab., West Mifflin, Pa.

ITERATIVE SOLUTION PROCEDURES FOR THE ADVANCED TIME PRESSURE FIELD IN THE SOLA AND BAAL FLUID FLOW PROGRAMS

C. S. Caldwell, L. A. Hageman, and D. A. Spragg Jul. 1981 59 p refs
(Contract DE-AC11-76PN-00014)
(DE82-000699; WAPD-TM-1478) Avail: NTIS HC A04/MF A01

The SOLA and BAAL programs solve isothermal, incompressible fluid flow problems in two and three spatial dimensions, respectively. Both programs use a type of point successive overrelaxation (SOR) iteration procedure to obtain the advanced time pressure field. For various reasons, these point methods are not always effective. In this paper, the utilization of block SOR methods in the SOLA and BAAL programs are discussed. Computational procedures for automatically determining good estimates for the optimal overrelaxation factor and for automatically deciding when to stop the iterative process are included. The use of block SOR procedures in the SOLA and BAAL programs have reduced the computer time by an order of magnitude for many problems. DOE

N82-27701# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

A NUMERICAL METHOD FOR THE SOLUTION OF INTERNAL PIPE/CHANNEL FLOWS IN LAMINAR OR TURBULENT MOTION

L. Lourenco and J.-A. Essers Nov. 1981 46 p refs
(VKI-TN-141) Avail: NTIS HC A03/MF A01

A computer program which is useful in the solution of problems of internal turbulent or laminar flow without recirculation is described. The flow is treated in terms of parabolic boundary layer differential equations. The eddy diffusivity concept is used to model turbulent stresses. Two turbulent models are available: the Prandtl mixing length model and the Nee-Kovasznay model for the effective viscosity. Fluid is considered incompressible, but little program modification is needed to treat compressible flows. Initial conditions are prescribed as well as the boundary conditions. The differencing scheme employed is fully implicit for the dependent variables. This allows the use of relatively large forward steps without stability problems. Author (ESA)

N82-27702# Sheffield Univ. (England). Dept. of Control Engineering.

THE INFLUENCE OF VAPOUR CAPACITANCE ON THE COMPOSITION DYNAMICS OF PACKED DISTILLATION COLUMNS

J. B. Edwards and M. Guilandoust Nov. 1981 17 p refs
(RR-166) Avail: NTIS HC A02/MF A01

A general transfer function matrix (TFM) expression is derived for the composition dynamics of ideal packed columns that are statically symmetrical, but are dynamically asymmetric, i.e., having a nonunity vapor/liquid capacitance ratio, c. For the special case of c = o, the system TFM is derived completely analytically to produce a parametric TFM, resembling that for c = 1. The result is successfully tested at high and zero frequencies against the initial and final values of the system step responses determined analytically and by time domain simulation. Complete inverse Nyquist diagrams are presented and compared with the c = 1 case. It is noted that whereas for c = 1, the system response for long columns is nonminimum phase, for c = o, the system behaves in a nonstrictly proper fashion with an abrupt initial negative response of magnitude similar to the nonminimum phase dip produced when c = 1. Hence, the variation of c does not greatly influence the general response characteristics of packed columns. Author (ESA)

N82-27703# Sheffield Univ. (England). Dept. of Control Engineering.

THE CALCULATION AND INTERPRETATION OF PARAMETRIC TRANSFER FUNCTIONS FOR BINARY DISTILLATION COLUMNS OF THE TRAY TYPE

J. B. Edwards and M. H. N. Tabrizi Feb. 1982 34 p refs
(RR-169) Avail: NTIS HC A03/MF A01

A transfer function matrix model for long, symmetrical, binary distillation columns was derived completely analytically from assumptions for dynamic analysis. The model relates twin output composition changes to perturbations in the internal liquid and vapor flow rates. The model is intended for use in controller design and, being expressed in terms of plant parameters and operating conditions, provides useful common ground between control engineer and plant designer. Though derived precisely for a symmetrical plant, the model applies more generally as a good approximation. Experimental data is given supporting this claim. Inverse Nyquist loci are generated in precise and approximate form and shown to compare favorably with computed step responses. The responses accord broadly with previous, part empirical, part numerical research results. Author (ESA)

N82-27704# Technische Univ., Berlin (West Germany). Inst. fuer Wasserbau und Wasserwirtschaft.

INVESTIGATION OF THE STABILITY OF A HYDRAULICALLY CONTROLLED FLOAT TANK/FLAP GATE WEIR, RIGIDLY CONNECTED BY A SHAFT, IN A RAINWATER DRAINAGE PIPE SYSTEM Final Report

Friedhelm Busch Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 120 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-006; ISSN-0340-7608; Rept-110-78-10) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,20

Rainwater runoff control in a mixed storm drain/sewer system was investigated. Fixed side weir outlets to a spillway were found unsatisfactory. A self-regulating float chamber/flap gate on an eccentric pivot was designed. With this type of construction, the spillway fills only in case of very heavy flooding. Lighter runoff is stored in the pipe network until it can be processed through the sewage treatment plant. Functional criteria by which this control system can be evaluated were sought. With respect to stationary boundary conditions the functional relationships between the limiting hydraulic quantities were studied theoreticaly and experimentally. Operating conditions are simulated by a numerical model in which the hydraulic quantities are assumed to be stationary within a time step. For any existing type of rainwater outlet construction, having a float chamber/flap gate system, this numerical method permits computation of the highest level of outlet, the point of equilibrium of the inflow and spilloff, the water surface, and the generating angle of the rainwater outlet construction. As an alternative, the points of equilibrium

can also be determined iteratively by using dimensioning graphs. Author (ESA)

N82-27705# National Bureau of Standards, Washington, D.C. National Engineering Lab.
HEAT TRANSFER ANALYSIS OF UNDERGROUND HEAT AND CHILLED-WATER DISTRIBUTION SYSTEMS
T. Kusuda Nov. 1981 63 p refs Sponsored in part by Navy, AF, and Army
(PB82-136235; NBSIR-81-2378) Avail: NTIS HC A04/MF A01 CSCL 13K

Simplified calculation procedures for determining heat exchange between the earth and a multiplicity of buried pipes having different temperature and thermal insulation are presented. The procedures deal with cases where pipes are buried side by side, as well as those when several pipes are bundled in a conduit. The effects of seasonal variation of earth temperature are treated in quasi-steady-state equation that includes the soil thermal properties, depth of burial, pipe sizes, and relative locations of pipes. Sample calculations are included, together with the FORTRAN program listing and thermal properties of earth to be used for the calculations. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-27706*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ABSTRACTS OF PAPERS PRESENTED AT THE ELEVENTH INTERNATIONAL LASER RADAR CONFERENCE
Jun. 1982 267 p refs Conf. held at Madison, Wisc., 21-25 Jun. 1982; sponsored in part by Wisconsin Univ., Am. Meteorol. Soc., AFOSR, and Air Force Geophys. Lab.
(NASA-CP-2228; L-15380; NAS 1.55:2228) Avail: NTIS HC A12/MF A01 CSCL 14B

Abstracts of 39 papers discuss measurements of properties from the Earth's ocean surface to the mesosphere, made with techniques ranging from elastic and inelastic scattering to Doppler shifts and differential absorption. Topics covered include: (1) middle atmospheric measurements; (2) meteorological parameters: temperature, density, humidity; (3) trace gases by Raman and DIAL techniques; (4) techniques and technology; (5) plume dispersion; (6) boundary layer dynamics; (7) wind measurements; visibility and aerosol properties; and (9) multiple scattering, clouds, and hydrometers. A.R.H.

N82-27707# National Physical Research Lab., Pretoria (South Africa). Div. of Optical Sciences.
CONVERSION OF SRSC FORMAT LANDSAT TAPES INTO VICAR COMPATIBLE FORMAT VCF TAPES
B. Turner Jun. 1981 66 p refs
(CSIR-FIS-256; ISBN-0-7988-2142-6) Avail: NTIS HC A04/MF A01

Two computer programs used to convert computer compatible LANDSAT data tapes into a format compatible with the VICAR m image processing system installed at the CCS IBM 370/158 computer are described. This system requires 2400 foot, 9 track magnetic tape with 1600 bits per inch density. A.R.H.

N82-27708*# Pacific Northwest Lab., Richland, Wash.
DEVELOP REAL-TIME DOSIMETRY CONCEPTS AND INSTRUMENTATION FOR LONG TERM MISSIONS Technical Progress Report, Feb. 1981 - Feb. 1982
L. A. Braby May 1982 20 p refs
(Contracts NASA Order T-794H; DE-AC06-76RL-01830)
(NASA-CR-167606; NAS 1.26:167606; PNL-4259) Avail: NTIS HC A02/MF A01 CSCL 06R

The development of a rugged portable instrument to evaluate dose and dose equivalent is described. A tissue-equivalent proportional counter simulating a 2 micrometer spherical tissue volume was operated satisfactorily for over a year. The basic elements of the electronic system were designed and tested. And finally, the most suitable mathematical technique for evaluating dose equivalent with a portable instrument was selected. Design and fabrication of a portable prototype, based on the previously tested circuits, is underway. Author

N82-27709# Philips Labs., Briarcliff Manor, New York.
DEVELOPMENT OF AN ELECTROPHORETIC IMAGE DISPLAY Quarterly Technical Report, 1 Aug. - 31 Oct. 1981
Richard Liebert Dec. 1981 20 p
(Contract MDA903-79-C-0349; DARPA Order 3802)
(AD-A110921) Avail: NTIS HC A02/MF A01 CSCL 14/5

The purpose of this work is to develop an X-Y addressed electrophoretic image display. Redeposit of indium oxide onto the walls of the potential wells formed by ion-beam milling has delayed delivery of Phase I displays suitable for evaluation by ISI. Methods for removing this redeposit were only partially successful, and means of preventing it are being sought. Several Phase I displays were successfully demonstrated within Philips; one was fabricated using the photopolymer technology being developed for Phase II. This and other devices using the photopolymer dielectric showed much less sticking of pigment, and therefore improved contrast, than that of the ion-beam-milled Mylar devices. Other photopolymers are being evaluated and perimeter sealing methods compatible with photopolymer construction are under investigation. Author (GRA)

N82-27710# Aeronautical Research Labs., Melbourne (Australia).
CORRELATION BETWEEN TWO SETS OF DATA PRESENTED AS RANGE-MEAN-PAIR COUNTS
P. J. Howard Jul. 1981 32 p refs
(AD-A112195; ARL/STRUC-NOTE-477; AR-002-301) Avail: NTIS HC A03/MF A01 CSCL 01/2

One beneficial attribute of the Aircraft Fatigue Data Analysis System (AFDAS) now being seriously considered by RAAF as an alternative to Fatigue Meters, is a capacity to self monitor through interchannel comparisons. This note describes a systematic approach to interchannel correlations when data are presented in the form of range-mean-pair counts. GRA

N82-27711# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
ANALYSIS AND DESIGN OF A NEW PHASE-MODULATED MICHELSON INTERFEROMETER
S. A. Eselun, R. C. Savedra, and E. G. Wolff 18 Dec. 1981 49 p refs
(Contract F04701-81-C-0082)
(AD-A112238; TR-0082(2935-07)-1; SD-TR-81-113) Avail: NTIS HC A03/MF A01 CSCL 14/2

A new interferometer signal processing system has been designed, analyzed, constructed, and tested. It is based on phase modulation of the interferometer followed electronically by quadrature mixing and frequency-modulated (FM)-type detection. As a result, the system is entirely independent of direct current (dc) or polarization effects, and only one photodetector is required to provide directional information. The output is digital and analog. The range of the unit with two 8-bit counters is presently + or - 64 lambda; however, more counters could be combined to provide a total delta L to the beam coherence length. The unit will detect signals to 30 kHz. Resolution through fringe interpolation is possible to + or - lambda/95 at present, which can be improved with electronic modifications. Phase sensitivity is much greater, with about 3-microvolt signal per angstrom of length change. Author (GRA)

N82-27712# Honeywell Systems and Research Center, Minneapolis, Minn.
MONOLITHIC ACCELEROMETER Final Report, 6 Sep. 1980 - 31 Oct. 1981
Harry A. Gustafson Wright-Patterson AFB, Ohio AFWAL Dec. 1981 45 p refs
(Contract F33615-80-C-1117)
(AD-A112825; HONEYWELL-81SRC76) Avail: NTIS HC A04/MF A01 CSCL 14/2

An investigation of the monolithic accelerometer was carried out to evaluate its potential for inertial navigation applications. The work included analysis and design studies, construction of a breadboard accelerometer, and laboratory testing. The approach used a suspension of two single-crystal silicon diaphragms joined to a frame of silicon or pyrex. Gold diffusion, thermoelectric, and optical contact bonds were used in the assembly. A differential capacitance pickoff was used to sense acceleration. Digital readout was obtained from the differential output of two oscillators, each slaved in frequency to its associated pickoff capacitor. Tests were conducted for bias, scale factor, scale factor linearity, and threshold. The tests showed that performance was limited by milli-g variations in bias and scale factor. The instabilities are attributed to residual stresses in the diaphragm suspension, resulting from the high-temperature bonding process. Recommendations are given for extending the concept to improved performance. Author (GRA)

N82-27713# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.

ESTIMATION OF SENSOR DETECTION PROBABILITIES WITH DATA FROM CONCURRENT SENSORS

Donald R. Barr Aug. 1981 29 p refs

(AD-A107443; NPS55-81-014) Avail: NTIS HC A03/MF A01 CSCL 09/4

When several sensors are concurrently scanning the same domain for signals, varying numbers of sensors may detect each signal. On some occasions, a signal may not be detected by any of the receivers. Using detection data collected from all the receivers over a period of scanning, it is possible to estimate the total number of signals that occurred in that period (including those that were not detected at all), as well as the detection probabilities for the individual receivers. Several estimators for these quantities are developed, in the contexts of several models concerning the signal generation process and the receiver behavior. Author (GRA)

N82-27714# Naval Postgraduate School, Monterey, Calif.

HOLOGRAPHIC INVESTIGATION OF SOLID PROPELLANT PARTICULATES M.S. Thesis

Thomas R. Gillespie Dec. 1981 39 p refs

(AD-A112748) Avail: NTIS HC A03/MF A01 CSCL 14/5

The investigation completed the development process to establish a technique to obtain holographic recordings of particulate behavior during the combustion process of solid propellants in a two-dimensional rocket motor. Holographic and photographic recordings were taken in a crossflow environment using various compositions of metallized propellants. The reconstructed holograms are used to provide data on the behavior of aluminum/aluminum oxide particulates in a steady state combustion environment as a function of the initial aluminum size cast into the propellant. High speed, high resolution motion pictures were taken to compare the cinematic data with that available from the holograms. Author (GRA)

N82-27715# Visidyne, Inc., Burlington, Mass.

PRELIMINARY LABORATORY MEASUREMENTS OF THE BOSS MODULATION TRANSFER FUNCTION

T. F. Zehnpfennig and S. A. Rappaport 5 Jun. 1981 32 p refs

(Contract F19628-79-C-0005; AF Proj. 7670)

(AD-A113152; VI-604; SR-6) Avail: NTIS HC A03/MF A01 CSCL 14/2

A dual-input radiometer with matched modulation transfer functions is described. The two MTF's are defined by the form of the two entrance pupils, one of which is annular and the other of which is circular. The radiometer switches alternately between the two pupils by means of a set of polarizing components. By detecting only the resulting fluctuations in the same image, the lower spatial frequencies in the object scene are suppressed. Preliminary measurements of the suppression characteristics as a function of spatial frequency are presented. Author (GRA)

N82-27716# Department of Energy, Pittsburgh, Pa. Energy Technology Center.

PRELIMINARY EVALUATION OF INSTRUMENTS FOR ON-LINE CHARACTERIZATION OF COAL-OIL MIXTURE FUEL

Mahendra P. Mathur and James M. Ekmann Jan. 1982 16 p refs

(DE82-004486; DOE/PETC/TR-82/2) Avail: NTIS HC A02/MF A01

Results of recent tests on coal-oil mixtures (COM) indicate that on-line continuous monitoring of key parameters - mass flow, coal content, and viscosity - is possible. Availability of this instrumentation can enhance the operation of control systems for COM preparation and combustion. Accurate measurement of density or coal content in COM is needed to monitor the reproducibility of preparation processes. Accurate mass flow measurements, coupled with data on the coal content, can be used to determine the instantaneous Btu input to a burner. Atomization characteristics, partly dependent on the fluid viscosity, can be adjusted using on-line viscometers linked to the fuel preheater. A number on-line instruments to measure mass flow, coal content or density, and viscosity in a flow system are examined. Instruments under study include a Micro Motion mass flow meter, which uses the Coriolis force exerted by a fluid flowing through a U-tube; n instrument manufactured by Aurburn International, Inc., which relies on the dielectric properties of COM to determine coal content: and a Brookfield on-line concentric cylinder viscometer. DOE

N82-27717# National Bureau of Standards, Washington, D.C.

DIMENSIONS/NBS. VOLUME 65, NUMBER 6 MARCH 1981 Monthly Report

Aug. 1981 28 p

(PB82-141490; NBS-DIM-65/6) Avail: NTIS HC A03/MF A01 CSCL 14B

Short summaries of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications are presented. The issue includes articles on: firefighting in the computer age; an effective method to predict drill failure; a method of probing 'hot' atom phenomena; and measuring PCB's in lubricating and cooling oils. T.M.

N82-27718# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

A SIMPLIFIED FREQUENCY DEVIATION TRANSDUCER

Eugene Campbell and James R. Schurz Nov. 1981 15 p refs

(PB82-150996; REC-ERC-81-13) Avail: NTIS HC A02/MF A01 CSCL 14B

A frequency deviation transducer with fast response was developed using period comparison in CMOS and analog logic. The transducer is useful in monitoring frequency where frequency deviaton is important and long term accuracy is not required. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-27719*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DEVELOPMENT OF A DIODE LASER HETERODYNE SPECTROMETER AND OBSERVATIONS OF SILICON MONOXIDE IN SUNSPOTS Ph.D. Thesis

David Alan Glenar Nov. 1981 171 p refs

(NASA-TM-83902, NAS 1.15:83902) Avail: NTIS HC A08/MF A01 CSCL 20E

A state of the art, tunable diode laser infrared heterodyne spectrometer was designed and constructed for ground based observations throughout the 8 to 12 micron atmospheric window. The instrument was optimized for use with presently available tunable diode lasers, and was designed as a flexible field system for use with large reflecting telescopes. The instrument was aligned and calibrated using laboratory and astronomical sources. Observations of SiO fundamental (v = 1-0) and hot band (v = 2-1) absorption features were made in sunspots near 8 microns using the spectrometer. The data permit an unambiguous determination of the temperature pressure relation in the upper layers of the umbral atmosphere, and support the sunspot model suggested by Stellmacher and Wiehr. M.G.

N82-27720# Defence Research Establishment Valcartier (Quebec).
PROPAGATION MODEL OF ADAPTIVELY CORRECTED LASER BEAMS IN TURBULENCE
L. R. Bissonnette Oct. 1981 45 p refs In ENGLISH; FRENCH summary
(AD-A110949; DREV-4200/81) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report describes a mathematical model for solving the propagation problem of laser beams traveling in atmospheric turbulence and corrected by adaptive optics. The modeling of the adaptive optics is mathematically simple but sufficiently general to encompass the majority of the existing systems. The model also includes the effects of beam jitter and partial coherence of the source. The method allows the prediction of the average irradiance and the irradiance variance beam profiles for arbitrary scintillation levels. Typical solutions are presented for 3.8- and 10.6 micron laser beams. These results illustrate the performance, after propagation in turbulence, of an adaptive system as a function of the wavelength, the number of active elements and the noise level. Author (GRA)

N82-27721# Helionetics, Inc., San Diego, Calif. Laser Div.
OPTIMIZATION OF EFFICIENCY OF A DISCHARGED-EXCITED XeCl LASER Interim Technical Report, 22 Oct. 1981 - 21 Feb. 1982
D. E. Rothe Mar. 1982 36 p refs
(Contract N00014-82-C-0087; ARPA Order 4370)
(AD-A112107; HLD-82-1R) Avail: NTIS HC A03/MF A01 CSCL 20/5

This work supports the Navy's strategic blue-green laser communication program. The specific goal is to raise the efficiency of an electric-discharge-excited XeCl laser to 3% or better. Efficient XeCl lasers are prime candidates for a satellite-borne laser transmitter. During the first 3 four months of this contract, the design, construction and assembly of a versatile XeCl laser test bed was completed. Initial checkout and performance tests are in progress. Without optimization of the pulse-forming-network, optical cavity and gas mixture, the laser has produced optical pulses with energies in excess of 1 joule with efficiencies over 1%. Prospects for raising these characteristics to 2 joules and 3% with proper optimization and injection locking are very good. GRA

N82-27722# Army Electronics Research and Development Command, Fort Belvoir, Va. Night Vision and Electro-Optics Lab.
QUANTUM MECHANICS APPLIED TO DYE LASERS
Carol K. Pearce Sep. 1981 32 p refs
(AD-A112122; DELNV-TR-0024) Avail: NTIS HC A03/MF A01 CSCL 20/5

The application of quantum mechanics to dye laser theory is reviewed, based upon recent semiclassical and fully quantum mechanical studies. Both semiclassical and fully quantum mechanical approaches were included. Phenomena investigated in the dye laser medium included spectral hole burning, propagation of light pulses, and light absorption and emission. Some studies realistically included consideration of the triplet state. Mixtures of lasing dyes, or of lasing and saturable absorber dyes, were not treated, nor were vapor dye lasers. Theoretical limitations that might be inherent in dye lasers, such as gain and power output, are other important areas that deserve examination in future studies. Author (GRA)

N82-27723# Georgia Univ., Athens.
NANOSECOND TIME-RESOLVED SPECTROSCOPY OF HIGH ENERGY PHONONS AND STUDIES OF NON-LINEAR PHONON PHYSICS Final Report, 15 May 1978 - 15 Nov. 1981
Richard S. Meltzer, John E. Rives, and David P. Landau 10 Mar. 1982 10 p refs
(Grant DAAG29-78-G-0107)
(AD-A112793; ARO-15205.5-P) Avail: NTIS HC A02/MF A01 CSCL 20/2

The dynamics of high frequency phonons has proven to be a difficult area of investigation. The general problem we have investigated is one of developing optical techniques to study high frequency phonon dynamics. A statement summarizing the problem, as we have examined it, can be most conveniently presented in four parts as described below; (1) The mechanisms of decay and lifetime of high frequency phonons (= or > 200 GHz) including the case of strong resonant trapping. (2) Generation of high frequency phonons by stimulated emission under conditions of a population inversion. (3) Development of computer simulation techniques to describe the dynamics of high frequency phonons resonantly trapped by an inhomogeneously broadened resonance with inclusion of stimulated emission; and (4) Development of techniques to reduce the spectral bandwidth of a coaxial flashlamp-pumped tunable dye lasers for use in problems (1) and (2). Problem (1) and (2) have been examined for several insulating ionic solids incorporating small amounts of impurity ions whose electronic states are accessible with visible light. The electronically excited ions serve to generate, detect and resonantly trap the nearly monoenergetic distribution of high frequency phonons. Author (GRA)

N82-27724# Rochester Univ., N. Y. Dept. of Chemistry.
LASER-STIMULATED MOLECULAR DYNAMICS AND RATE PROCESSES
Thomas F. George Nov. 1981 54 p refs
(Contract N00014-80-C-0472)
(AD-A107246; TR-14) Avail: NTIS HC A04/MF A01 CSCL 20/5

A review of theoretical work by the author and collaborators and related experiments is presented for two segments of laser-induced chemistry: molecular dynamics and rate processes in the gas phase and at a solid surface and gas-surface interface. For the gas phase, the focus is on situations where the radiation interacts directly with the dynamics to enhance or create new processes. The field of laser-surface chemistry is still undergoing a procedure of definition, and progress to date is discussed. Theoretical failures as well as successes are analyzed and viewpoints are offered as to new directions for both theory and experiment. Author (GRA)

N82-27725# Stanford Univ., Calif. Physics Lab.
RESEARCH STUDIES ON RADIATIVE COLLISIONAL PROCESSES Annual Technical Report, 1 Oct. 1980 - 30 Sep. 1981
S. E. Harris and J. F. Young Jan. 1982 26 p refs
(Contract F49620-80-C-0023; AF Proj. 2301)
(AD-A112400; SU-GL-3379; AFOSR-82-0121TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

This program has supported theoretical and experimental studies in three broad areas. The first is a study of pair absorption processes which may be viewed as a collisional process in which two atoms and a photon simultaneously react and exchange energy. The present goal is to investigate the possibility of using such processes to construct new types of lasers. Secondly, we have invented and developed a promising new technique for pumping high pressure gas systems using high power microwave pulses. This work has led to two related projects: excitation of rare gas halide excimer lasers to achieve long pulse lengths, high reliability and good efficiencies, and the excitation of metal vapors to create new lasers. Finally, we have been applying the anti-Stokes light source developed here to practical measurements of VUV spectral features both to elucidate the physics of such innershell transitions and to search for transitions suitable for short wavelength lasers. This last project has also been partially supported by NASA. Section 2 summarizes our research findings for these projects, and Sections 3 and 4 list the publications and personnel, respectively, supported by this program. GRA

N82-27726# Electronics Research Lab., Adelaide (Australia).
PROCEEDINGS OF THE FOURTH LASER HYDROGRAPHY SYMPOSIUM AT DEFENCE RESEARCH CENTRE AND ROYAL AUSTRALIAN NAVY HYDROGRAPHIC OFFICE
Mike F. Penny, ed. and David M. Phillips, ed. Mar. 1981 566 p refs Symp. held at Salisbury, South Australia and North Sydney, New South Wales, 30 Sep. - 3 Oct. 1980
(AD-A107080; ERL-0193-SD; AR-002-576) Avail: NTIS HC A24/MF A01 CSCL 08/8

At this Symposium, research on laser hydrography and related development programs currently in progress in the United States of America, Canada, and Australia, were reported. The depth sounding systems described include the US Airborne Oceano-

graphic Lidar and Hydrographic Airborne Laser Sounder, the Canadian Profiling Lidar Bathymeter, and the Australian Laser Airborne Depth Sounder. Other papers presented research on blue-green lasers, theoretical modelling, position fixing, and data processing. Author (GRA)

N82-27727# Electronics Research Lab., Adelaide (Australia).
AN IMPROVED PRISM FOR USE IN LASER RESONATORS
J. Richards Aug. 1981 16 p refs
(AD-A112178; ERL-0212-TM) Avail: NTIS HC A02/MF A01 CSCL 20/5

The use of compound total internal reflection prisms rather than Porro prisms in polarisation coupled lasers is proposed. Performance advantages resulting from the use of these prisms include higher output without the need to bias the Pockels cell, ability to give a larger range of output coupling and independence of performance on the refractive index of the prism. In conventional Q-switched lasers the use of the prism at the Pockels cell end of the resonator instead of the usual 100% reflecting mirror also leads to some advantages including better hold-off, elimination of the need to bias the Pockels cell and insensitivity in one plane to angular misalignment. GRA

N82-27728# Electronics Research Lab., Adelaide (Australia).
AN UNPOLARISED ELECTRO-OPTICALLY Q-SWITCHED LASER
J. Richards Aug. 1981 15 p refs
(AD-A112177; ERL-0213-TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

A novel laser design is given that uses a special polarising device to generate unpolarised Q-switched laser energy with a conventional electro-optic Pockels cell. The special polarising device, which replaces the linear polariser normally used in conventional Q-switched resonators, allows solid state lasers to operate efficiently at high repetition rates. Other features of the design include the elimination of the beam non-uniformities that normally occur at high repetition rates, the elimination of the need to bias the Pockels cell and the ability to produce, by a simple mirror realignment, a plane polarised output with high efficiency. GRA

N82-27729# SRI International Corp., Menlo Park, Calif. Molecular Physics Center.
DIAGNOSTICS DEVELOPMENT FOR E-BEAM EXCITED AIR CHANNELS Semiannual Technical Report
D. J. Eckstrom and J. S. Dickenson 18 Feb. 1982 33 p refs
(Contract N00014-81-C-0208; ARPA Order 4128; SRI Proj. PYU-2690)
(AD-A112583; SRI-MP-82-119; SATR-1) Avail: NTIS HC A03/MF A01 CSCL 20/7

As the tempo of development of particle beam weapons increases, more detailed diagnostics of the interaction of the particle beam with the atmosphere are being proposed and implemented. Some of these diagnostics involve probing of the excited air channel with visible wavelength laser radiation. Examples include the use of visible wavelength interferometry to measure electron density profiles in the nose of the beam Ri81 and Stark shift measurements to determine self-induced electric fields Hi81, DR81. In these diagnostics, the change in laser intensity due to the desired diagnostic effect can be quite small, leading to the possibility that other effects, such as gas phase absorption, could seriously interfere with the measurement. Author (GRA)

N82-27730# National Bureau of Standards, Washington, D.C. Molecular Spectroscopy Div.
ROTATIONAL AND SPIN-STATE DISTRIBUTATIONS: NO THERMALLY DESORBED FROM Ru(001)
Richard R. Cavanagh and David S. King 3 Mar. 1982 15 p refs Submitted for publication
(Contract N00014-82-F-0007)
(AD-A112173; TR-27) Avail: NTIS HC A02/MF A01 CSCL 20/5

Rotational state distributions have been measured for the first time in molecules thermally desorbed from a metal single crystal. Laser excited fluorescence has been used to monitor, under ultra-high vacuum conditions, the desorption of NO from Ru(001). The population distribution for those states with less than 400/cm of rotational energy (including spin) can be represented by a single Boltzmann factor, T(rot) = 235 + or - 35K, significantly lower than the surface temperature at the desorption maximum, T(S) = 455 + or - 20K. GRA

N82-27731# Naval Research Lab., Washington, D. C. Radiations-Matter Interactions Branch.
A SEARCH FOR SESR Final Report
L. Cohen, N. Seeman, and K. Murray, Jr. 31 Mar. 1982 20 p refs
(AD-A112486; NRL-MR-4778) Avail: NTIS HC A02/MF A01 CSCL 20/8

Dielectric materials transparent at visible wavelengths are irradiated with relativistic electrons, with infra-red radiation from a ND:YAG laser, and with both of these radiations simultaneously. The radiation resulting from these interactions is observed, measured, and discussed in the light of recent theories. Author (GRA)

N82-27732# Naval Research Lab., Washington, D. C. Applied Optics Branch.
TECHNICAL ANALYSIS OF A PROPOSED SHIP-TO-SHIP CHEMICAL LASER TRANSMISSION EXPERIMENT Interim Report
D. H. Leslie 16 Feb. 1982 168 p refs
(AD-A112804; NRL-MR-4745) Avail: NTIS HC A08/MF A01 CSCL 21/5

Equipment and procedures for performing a DF laser ship-to-ship transmission experiment are described. A low-power, CW DF laser, a Fourier Transform Spectrometer, and a 32 inch diameter optical tracking system with 50 microradian resolution will be installed aboard the aircraft carrier USS LEXINGTON. A 60 inch-diameter tracking receiver and aerosol and meteorological equipment will be installed aboard an escort ship. Precise absolute transmittance measurements using the laser source, and high resolution infrared spectral measurements using the spectrometer, will be performed between the two ships at separations from 1 to 5 kilometers. The expected precision of the derived data is discussed. The contribution of the experiment results toward improving DF laser propagation model-validation is analysed in great detail. Five appendices contain discussions of tracker and optical engineering details and a discussion proposing related LIDAR measurements. Successful completion of the project, we conclude, will provide the Navy and HEL community with a dual large aperture tracking system for performing significant atmospheric transmission measurements using a ship-based, combustion-driven DF laser. Author (GRA)

N82-27733# Naval Research Lab., Washington, D. C. Plasma Physics Branch.
ABLATIVE ACCELERATION OF PLANAR TARGETS TO HIGH VELOCITIES Interim Report
J. Grun, S. P. Oberschain, B. H. Ripin, R. R. Whitlock, E. A. McLean, J. Gardner, M. J. Herbst, and J. A. Stamper 30 Mar. 1982 48 p refs
(AD-A112717; NRL-MR-4747) Avail: NTIS HC A03/MF A01 CSCL 20/5

Laser irradiated targets are ablatively accelerated to velocities near those required for fusion pellet implosions while remaining relatively cool and uniform. The target velocities and velocity profiles are measured using a double-foil method, which is described in detail. Also, the ablation plasma flow from the target surface is spatially resolved, and the scalings with absorbed irradiance of the ablation pressure, ablation velocity, and mass ablation rate are determined. Results are compared with hydrodynamic code calculations. Author (GRA)

N82-27734# Hughes Research Labs., Malibu, Calif.
EXPERIMENTAL INVESTIGATION OF THE FREE ELECTRON LASER Final Report, 21 Sep. 1979 - 31 Dec. 1981
Frank A. Dolezal, R. J. Harvey, A. J. Palmer, and C. G. Parazzoli Feb. 1982 82 p refs
(Contract N00014-79-C-0957)
(AD-A113740) Avail: NTIS HC A05/MF A01 CSCL 20/5

An e-gun, depressed collector and guide-field solenoid has been designed for operation at a maximum of 400 kV and 38 A. The results of experiments with this brassboard system include

demonstration of depressed collector recovery efficiencies of over 90% for e-beam voltages from 160 to 300 keV and currents up to o25 A. We have also confirmed Hughes computer-code predictions that a space-charge depression in the collector (which is essential to efficient collection) forms at a collector-voltage setting of 1% of the beam voltage. These results demonstrate the validity of substantially increasing the efficiency of FEL systems, by using depressed collectors to recover the bulk of the energy which is left in the e-beam after it leaves the laser resonator. Preliminary indications are that the recovery efficiency (recovered current/cathode-emission current) increases gradually with beam voltage (reaching 94% at 300 keV) as beam spreading due to thermal effects and sensitivity to the focusing-field strength are reduced. We expect to translate these results into FEL-system efficiencies of an order of magnitude higher per stage than would be possible without the use of depressed collection. End-on Thomson scattering was identified as the most feasible technique for this measurement. A Thomson scattering experiment has been designed and hardware implemented into the brassboard system. GRA

N82-27735# Texas Technological Univ., Lubbock. Dept. of Physics and Engineering Physics.
INVESTIGATIONS IN X-RADIATION STIMULATION Final Scientific Report, 1 Sep. 1976 - 31 Jan. 1982
Kamalaksha Das Gupta Mar. 1982 54 p
(Grant AF-AFOSR-3098-76; AF Proj. 2306)
(AD-A113870; AFOSR-82-0328TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

The objective is to invent a crystal X-ray laser. Investigations in the Radiation Research Lab. at Texas Tech University have established in a very straightforward way the line narrowing associated with a threshold pumping and a nonlinear rise in intensity. Recent work on X-ray Borrmann channeling via monocrystals has demonstrated the existence of a monochromatic X-ray beam without any vertical divergence. This would allow the transport of x-ray energy in space for thousands of miles without any loss of power. Preliminary experiments with a monocrystal excited by pulsed X-rays at Air Force Weapons Laboratory, KAFB, Albuquerque, seem to indicate a gain in intensity of the nondivergent hot spot with a concomitant fading of the regular Laue pattern. Current investigations in this line indicates that with proper doping of the monocrystal the nondivergent beam could be increased in intensity using a flash X-ray tube to pump the doped monocrystal. A concial target double beam flash X ray line source instrument has been constructed to obtain a beam of nondivergent, stimulated, coherent, and monochromatic X-rays from doped monocrystals. A generation of stimulated X-rays using bunched electrons from pulsed high power klystron striking a monocrystal has been conceived. GRA

N82-27736# Naval Research Lab., Washington, D. C. Laser Physics Branch.
DARPA-NRL LASER PROGRAM ANNUAL TECHNICAL REPORT TO DEFENSE ADVANCED RESEARCH PROJECTS AGENCY Annual Report, 1 Oct. 1979 - 30 Sep. 1980
R. Burnham, L. F. Champagne, R. S. F. Chang, R. W. Waynanat, L. J. Palumbo, and N. Djeu 11 Mar. 1982 80 p refs
(Contract DARPA Order 2062)
(AD-A113615; NRL-MR-4768) Avail: NTIS HC A05/MF A01 CSCL 20/5

The e-beam pumped XeCl laser has been investigated experimentally at pump current densities up to 15A/Sq cm. The results have been compared with NRL's XeCl laser kinetics code, and satisfactory agreement was found. To obtain a better understanding of the neutral formation channel of XeCl*, the Xe(3P2) + HCl (v = 1) reaction has been studied and a lower bound on the formation rate constant of 2 x 10 to the -10th power cc/sec was deduced. To assess the potential of the Pb vapor Raman converter for repulsed operation, measurements of collisional quenching of Pb(3P2) and Pb(3P1) by ground state atoms were carried out, which yielded rate constants of 3.2 x 10 to the -13th power cc/sec and 2.0 x 10 to the -13th power respectively. Author (GRA)

N82-27737# California Univ., Livermore. Lawrence Livermore Lab.
FEASIBILITY OF LASER-SEPARATION OF 36 S AND ITS USE AS AN ATMOSPHERIC TRACER
Irving P. Herman 18 Aug. 1981 14 p refs
(Contract W-7405-eng-48)
(DE82-000965; UCID-19167) Avail: NTIS HC A02/MF A01

The use of laser produced sulfur isotopes to analyze the acid rain situation is considered. The proposed use of isotopically labelled SO2, in particular of (56)SO2, as a tracer can help elucidate the chemical and transport facets in a unified experiment. Separation of a sufficient quantity of the rare (36)S isotope to perform several of these tracer studies appears to be practical and economical. T.M.

N82-27738# Battelle Inst., Frankfurt am Main (West Germany).
DEVELOPMENT OF A RECEIVER UNIT FOR LASER DATA LINKS: LOCAL OSCILLATOR LASER Final Report
M. Endemann and W. Englisch Paris ESA Jan. 1982 66 p refs
(Contract ESTEC-4324/80/NL-HP(SC))
(BleV-R-64.560-1; ESA-CR(P)-1539) Avail: NTIS HC A04/MF A01

A tunable, high pressure, sealed CO2 waveguide laser which can serve as local oscillator in a coherent receiver unit for wideband laser communications in space was breadboarded. The laser provides linearly polarized single frequency output in the fundamental transverse mode. The highly stable emission frequency should be tunable over a range of + or - 650 MHz. A 7 yr service life is specified. The longitudinal dc glow discharge sections start easily at pressures up to 200 torr, using a pure He filling. With the grating installed, maximum output power is 250 mW on the P(20) of the 001 to 100 band at 10.59 microns. The selection of different CO2 transitions in the same band and tuning the output frequency with the piezo drive are possible. The tuning range, however, is only + or - 250 MHz at 170 torr. The resonator assures operation in the fundamental transverse mode. Author (ESA)

N82-27739# Hartmann und Braun A.G., Frankfurt am Main (West Germany). Entwicklung Analysentechnik.
INVESTIGATION INTO THE COMMERCIAL APPLICATION OF INFRARED TECHNOLOGY: LEAD CHALCOGENIDE LASER DIODES Final Report
Reimar Faulhaber Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 68 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-061; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,30

Possible applications of semiconductor diode lasers, based on ternary Pb chalcogenides, are discussed. The emission range of these lasers is in the middle and far infrared in the wavelength region between 2.5 and 30 micrometers. By means of the chemical composition, the temperature, and the electrical current, a precise adjustment of the emission wavelength of the laser is possible. Applications are in the laboratory as well as in industrial processes, test stands, and in the medical field. The major part of 88% of the total market potential is likely to be in the fields of emission measurement on combustion engines and pollution control. The total market potential of the Federal Republic of Germany is assumed to be 22 million DM per annum. Author (ESA)

N82-27388*# Massachusetts Inst. of Tech., Cambridge.
LASER MATERIALS PROCESSING FACILITY
J. S. Haggerty *In its* The Mater. Process. Res. Base of the Mater. Process Center 28 Jun. 1982 p 95-96 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-27740# Ferodo (Proprietary) Ltd., Durban (South Africa). Technical Sales Dept.

SOURCES OF BRAKE SQUEAL IN MOTOR VEHICLES
R. K. Goatley 1981 12 p refs Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981
Avail: NTIS HC A02/MF A01

Squeal is identified as a frictional vibration dependent on the coefficient of friction of the lining and its contact geometry. The mass and stiffness of related parts such as drum, shoe, and caliper, are contributory factors. Their influence on squeal in both disc and drum brake installations is discussed. Practical solutions to the problem are considered within limitations imposed by brake performance requirements. Author

N82-27741# Atlantis Diesel Engines (Pty) Ltd., Cape Town (South Africa). Development Dept.
REVIEW OF DIESEL ENGINE NOISE
Martin J. J. Slabber 1981 21 p refs Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981
Avail: NTIS HC A02/MF A01

The mechanism of noise generation from diesel engines and associated components and structures is presented. Methods for establishing the main sources of noise and the effectiveness of structural redesign together with the influence of encapsulation are reviewed. Author

N82-27742# Volkswagen A.G., Wolfsburg (West Germany).
STUDYING SOURCES OF BRAKE NOISE WITH COHERENT OPTICAL AND HOLOGRAPHIC MEASURING TECHNIQUES
A. Felske 1981 16 p refs Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981
Avail: NTIS HC A02/MF A01

The analysis of vibrations on squealing brake systems by optical measuring techniques is described. Laser Doppler velocimetry, image derotation and holographic interferometry are considered. The localization of noise sources and quantitative measurement of elaborated vibration centers by the laser Doppler technique on rotating and nonrotating components is described. Applications of these methods to prevent brake squeal of disk and drum brakes are demonstrated. J.D.

N82-27743*# Curtiss-Wright Corp., Wood-Ridge, N.J. Rotary Engine Facility.
ADVANCED STRATIFIED CHARGE ROTARY AIRCRAFT ENGINE DESIGN STUDY
P. Badgley, M. Berkowitz, C. Jones, D. Myers, E. Norwood, W. B. Pratt, D. R. Ellis (Cessna Aircraft Corp.), G. Huggins (Cessna Aircraft Corp.), A. Mueller (Cessna Aircraft Corp.), and J. H. Hembrey (Cessna Aircraft Corp.) 29 Jan. 1982 149 p refs
(Contract NAS3-21285)
(NASA-CR-165398; NAS 1.26:165398; CW-WR-81.021) Avail: NTIS HC A07/MF A01 CSCL 21A

A technology base of new developments which offered potential benefits to a general aviation engine was compiled and ranked. Using design approaches selected from the ranked list, conceptual design studies were performed of an advanced and a highly advanced engine sized to provide 186/250 shaft Kw/HP under cruise conditions at 7620/25,000 m/ft altitude. These are turbocharged, direct-injected stratified charge engines intended for commercial introduction in the early 1990's. The engine descriptive data includes tables, curves, and drawings depicting configuration, performance, weights and sizes, heat rejection, ignition and fuel injection system descriptions, maintenance requirements, and scaling data for varying power. An engine-airframe integration study of the resulting engines in advanced airframes was performed on a comparative basis with current production type engines. The results show airplane performance, costs, noise & installation factors. The rotary-engined airplanes display substantial improvements over the baseline, including 30 to 35% lower fuel usage. A.R.H.

N82-27744# Columbia Univ., New York.
AN INTEGRATED APPROACH TO THE OPTIMIZATION OF HIGH-SPEED CAM-FOLLOWER SYSTEMS Final Technical Report, 1 Aug. 1978 - 31 Jul. 1981
Ferdinand Freudenstein 15 Sep. 1981 5 p refs
(Contract DAAG29-80-C-0135; Grant DAAG29-78-G-0176)
(AD-A107387; ARO-12953.7-E; ARO-15911.2-E) Avail: NTIS HC A02/MF A01 CSCL 13/9

Research has resulted in basic measurements on the dynamic response of a modern, high-speed cam-follower systems; the development of a predictive dynamic model for the dynamic response of high-speed cam-follower systems, both for normal behavior and the onset of toss, bounce and spring surges; and the application of optimal-control theory to the optimization of cam-follower systems in the design stage. Author (GRA)

N82-27745# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Vehicle Equipment Div.
WET TRACTION TESTS: MARCY SIPED TIRE Final Report, Aug. 1977 - Sep. 1979
Paul C. Ulrich Feb. 1982 206 p refs
(AF Proj. 2405)
(AD-A112187; AFWAL-TR-81-3068) Avail: NTIS HC A10/MF A01 CSCL 01/3

The purpose of this program was to laboratory test, track test, and evaluate the improvements in viscous hydroplaning or wet surface traction provided by the Marcy siped aircraft tire treads and to determine if this process compromised the tread integrity of the tires. The results of the high speed dynamometer tests indicated that the tread integrity of the F-4 and F-16 main gear tires were not adversely affected by the Marcy tread sipe configuration that were tested. The results of the F-4 tire wet traction laboratory tests and the KC-135 tire track tests indicated significant improvements in lateral force, developed brake torque, and stopping performance for the 1/4 inch deep by 3/16 inch spacing Marcy siped tire tread configuration when compared to a standard (unsiped) tread design. This improvement in wet traction, however, was reduced to a negligible amount when the sipe depth is reduced by tire wear to depths less than 1/8 inch as demonstrated by the wet portland cement track tests. None of the Marcy sipe configurations, however, prevented dynamic hydroplaning when the tires encountered standing water at high speeds during the track tests. GRA

N82-27746# IIT Research Inst., Chicago, Ill.
WEAR AND CORROSION OF COMPONENTS UNDER STRESS AND SUBJECTED TO MOTION Interim Report, 14 Sep. 1979 - 14 Sep. 1981
K. Y. Kim and S. Bhattacharyya Warminster, Pa. NADC 5 Feb. 1982 108 p
(Contract N62269-79-C-0702)
(AD-A113813; IITRI-M06060-8; NADC-79137-60) Avail: NTIS HC A06/MF A01 CSCL 13/9

The effects of both electrochemical and mechanical factors on the material degradation of bearing components applicable to aircraft were studied. Corrosion behavior of the materials under stress and motion was evaluated. Corrosion current density, open circuit potential, and wear loss were analyzed. The effect of continuous wear on the corrosion process is significant when a passive film is formed in air or in solution. Generation of active metal surface by disruption of passive film under wear is mainly responsible for increase in corrosion current and the open circuit potential shift. Analytical scanning electron microscopy was used for metallurgical examination of the corrosion wear surface morphology. It is shown that deposition of Cr and Mo is higher in the activated wear debris that at general wear scar areas. It appears that wear controls the anodic polarization process significantly, but not the cathodic polarization process. E.A.K.

N82-27747# Dayton Univ., Ohio. Research Inst.
ACCELERATED LIFE PREDICTION TECHNIQUES Final Report, 31 Jul. 1978 - 31 May 1981
K. Davis, M. Keller, and R. Martin Wright-Patterson AFB, Ohio AFWAL Nov. 1981 115 p refs
(Contract F33615-78-C-5107; AF Proj. 2421)
(AD-A113766; UDR-TR-81-90; AFWAL-TR-81-4137) Avail: NTIS HC A06/MF A01 CSCL 17/2

Exploratory development was conducted in the area of accelerated life prediction techniques for satellite despin mechanical assembly bearings and data transmission slip ring assemblies. Slip ring assemblies were instrumented and operated in a simulated space environment. Data were taken and analyzed.

Bearing test rigs were set up, instrumented and operated. Studies were conducted to determine the chemical and physical properties of the commonly used space lubricant. Degradation studies of this material were also conducted. Author (GRA)

N82-27748# Detroit Diesel Allison, Indianapolis, Ind. IGT Applications Dept.
GAS TURBINE ENGINES AND TRANSMISSIONS FOR BUS DEMONSTRATION PROGRAM Final Report
D. N. Nigro Nov. 1981 39 p
(Contracts DE-AC02-78CS-54867; EM-78-C-02-4867)
(DE82-004908; DOE/CS-54867/T1; COO-4867-08; EDR-10876) Avail: NTIS HC A03/MF A01

Eleven Allison GT 404-4 industrial gas turbine engines and five HT740CT and six V730CT Allison automatic transmissions for the Greyhound and Transit Coaches test program are described. Engine configurations are described and acceptance test performance data presented. DOE

N82-27749# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN AND FABRICATION OF CONTAINMENT RINGS fr USE IN TESTS OF SIX PROTOTYPE FLYWHEEL ROTORS
Anthony P. Coppa (General Electric Co., Philadelphia) Feb. 1981 106 p refs
(Contract W-7405-eng-48)
(DE81-030357; UCRL-15370) Avail: NTIS HC A06/MF A01

Containment rings were designed and fabricated to perform prototype flyheel rotor tests. Six open containment ring designs were developed based on the characteristics of six different rotors each with a particular failure mode. The containment requirements for each rotor and the designs developed are described. DOE

N82-27750# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systems Balistiques et Spatiaux.
MAGNETIC BEARING FLYWHEELS FOR ELECTRIC STORAGE
Pierre C. Poubeau 1981 11 p refs Presented at Intern. Energy Agency Conf. on New Energy Conservation and their Commercialization, Berlin, 6-10 Apr. 1981
(SNIAS-821-422-110) Avail: NTIS HC A02/MF A01

A magnetic bearing flywheel was designed. In order to have a simple, reliable system, magnetic suspension with a single servoloop for one degree of freedom of the rotor was used, four other degrees of freedom being controlled passively and the sixth one, corresponding to the rotation axis. The motor that transfers electric energy to the rotor is of the ironless brushless dc type with electronic commutation. It is operated alternatively for accelerating the wheel and then as a generator for delivering the stored energy. The use of high stress composite materials in the rotor greatly increases the operational limits of this equipment. Key characteristics of kinetic energy storage are mentioned along with a wide range of applications. Besides energy storage for satellites, these include power smoothing for solar and wind energy systems as well as backup power supplies, e.g., for electric vehicles. Author (ESA)

N82-27751# Societe Nationale Industrielle Aerospatiale, Les Mureaux.(France).
MAGNETIC SUSPENSION AND FLYWHEELS: SPACEBORNE AND TERRESTRIAL APPLICATIONS [LA SUSPENSION MAGNETIQUE ET LES VOLANTS D'INERTIE: APPLICATIONS SPATIAUX ET TERRESTRES]
Pierre C. Poubeau 1981 4 p In FRENCH Presented at Conf. Aerospatiale a la Journee sur l'Espace et son Futur, Toulouse, Oct. 1981 Sponsored by SITEF
(SNIAS-821-422-111) Avail: NTIS HC A02/MF A01

Satellite attitude control, using inertia wheels, is discussed. Elimination of friction effects through application of magnetic bearings is considered. The inertia wheel/magnetic bearing configuration can also be used to store kinetic energy. Higher rotational velocities create a need for stronger rotor construction materials; improved mechanical properties can be achieved with composite materials. Kinetic energy storage for earthside applications (solar energy storage; electric vehicles) is mentioned. Author (ESA)

N82-27752# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
LASER WELDING OF METALLIC SANDWICH STRUCTURES (NORSIAL) [SOUDAGE LASER DE STRUCTURES SANDWICH METALLIQUES NORSIAL]
Maroutel 1981 22 p In FRENCH
(SNIAS-821-422-114) Avail: NTIS HC A02/MF A01

Manufacturing of Norsial (trademark) sandwich structures is described. An electrical resistance welding process whereby metal sheet is welded to a corrugated center, or stacks of corrugated sheet, is outlined. In order to cut production costs, introduction of laser welding in place of resistance welding is considered. A laser welding machine was developed. Rigid Norsial panels were produced, using this machine and numerical control. Compression test results show that laser welded Norsial panels have the same, or better, mechanical properties (structural reliability) as conventionally produced ones. Author (ESA)

N82-27393*# Massachusetts Inst. of Tech., Cambridge.
ADAPTIVE MATERIALS PROCESSING
T. W. Eager *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 155-158 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 13I

N82-27399*# Massachusetts Inst. of Tech., Cambridge.
WELDING RESEARCH
In its The Mater. Process. Res. Base of the Mater. Process Center 28 Jun. 1982 p 217-277 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-27753# SRI International Corp., Menlo Park, Calif. Remote Measurements Lab.
NONLINEAR ELECTROMAGNETIC SCATTERING TECHNIQUES FOR THE DETECTION AND CHARACTERIZATION OF CLOSED CRACKS Final Report, 1 Oct. 1980 - 30 Sep. 1981
A. J. Bahr, J. P. Watjen, and J. H. Giovanola Nov. 1981 75 p refs
(Contract F44620-79-C-0005; AF Proj. 2306; SRI Proj. 7908)
(AD-A110506; AFOSR-82-0017TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

An improved nondestructive evaluation technique for detecting and characterizing tightly closed cracks on surfaces of metal parts was studied. The technique is based on exploiting the nonlinear eddy-current interaction that would occur if a nonlinear junction existed between the faces of a closed crack. It is suggested that the dominant physical mechanism involved is electron tunneling in a metal-oxide-metal junction. It is difficult to keep spurious background levels from masking the desired crack signals, because nonlinear junctions required for detecting do not always form in the crack. Monitoring of nonlinear crack signals can yield information on the rate of crack growth. A simple model for a nonlinear crack shows that the nonlinear signal produced by a crack is strongly dependent on the impedances of the crack at the measurement frequencies, and particularly on the area and thickness of the nonlinear junction. Calculations using this model indicate that the use of frequencies in the low microwave range should produce the largest nonlinear signals. E.A.K.

N82-27754# Office of Naval Research, London (England)
THIRD NATIONAL RELIABILITY CONFERENCE BIRMINGHAM, ENGLAND
M. B. Kline 1 Sep. 1981 11 p refs
(AD-A107449; ONRL-C-8-81) Avail: NTIS HC A02/MF A01 CSCL 14/4

This conference on the subject of reliability covered a broad

range of topics, from the many aspects of reliability management to considerations of hardware, software, and the human factors involved. GRA

N82-27755# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
FEASIBILITY OF INSPECTING ADHESIVE BONDED STRUCTURES FOR BOND STRENGTH USING ULTRASONIC SPECTROSCOPY Final Report, Jul. 1979 - Feb. 1982
T. J. Igielski, S. S. Blecherman, and J. E. Doherty Watertown, Mass. Army Materials and Mechanics Research Center. Mar. 1982 53 p refs
(Contract DAAG46-79-C-0039)
(AD-A113803; FR-13390; AMMRC-TR-82-16) Avail: NTIS HC A04/MF A01 CSCL 13/8

A study for using ultrasonic spectroscopy as a nondestructive evaluation method for determining the integrity of adhesive bonds between composite materials and metals was evaluated. Mechanical properties of bonded joints were compared to acoustic parameters for various adhesive substrate systems.Author (GRA)

N82-27756# Stanford Univ., Calif. Labs. of Physics.
ACOUSTIC MICROSCOPY FOR NONDESTRUCTIVE EVALUATION OF MATERIALS Final Report, 1 Jul. 1978 - 31 Dec. 1981
C. F. Quate Dec. 1981 82 p refs
(Contract F49620-78-C-0098; ARPA Order 3569)
(AD-A113874; GL-3365; AFOSR-82-0310TR) Avail: NTIS HC A05/MF A01 CSCL 14/5

This report covers the results of a research program on acoustic microscopy directed toward the study of integrated circuits and solid materials. This new type of microscopy permits one to examine microscopic features that are unaccessible in the optical microscope. Thus detail beneath metallization layers as well as the grain boundaries in polished samples can be examined without resorting to chemical etching. Adhesion of thin film is a field where acoustic microscopy will play an important role. Photoacoustic imaging is emerging as a key element in the study of thermal properties of materials and some initial results in this area are included. Author (GRA)

N82-27757# Stanford Univ., Calif.
ACOUSTIC MICROSCOPY AT CRYOGENIC TEMPERATURES Semiannual Status Report, 1 Jul. 1981 - 1 Jan. 1982
C. F. Quate and J. Heiserman Jan. 1982 54 p refs
(Contract N00014-77-C-0412; NR Proj. 384-924)
(AD-A113312; GL-3388) Avail: NTIS HC A04/MF A01 CSCL 14/5

During this six month period we completed construction of a mechanical scanning device compatible with our dilution refrigerator and suitable for use at very low temperatures. This device has now been thoroughly tested and was used to record our first acoustic images in liquid helium at temperatures below 0.1 K. This report describes the design of the mechanical scanner and presents the first micrographs taken in this new regime of imaging. We also present theoretical results which account for much of the nonlinear imaging behavior described in the previous status report. In particular we investigate the theory of resolution improvement when high acoustic intensities are used, and quantitatively account for the onset of nonlinear excess attenuation. Author (GRA)

N82-27758# Maryland Univ., College Park. Dept. of Management and Statistics.
EFFECTS OF FALSE AND INCOMPLETE IDENTIFICATION OF DEFECTIVE ITEMS ON THE RELIABILITY OF ACCEPTANCE SAMPLING
Samuel Kotz and Norman L. Johnson (North Carolina Univ., Chapel Hill) Apr 1982 15 p refs
(Contract N00014-81-K-0301; Grant NSF MCS-80-21701)
(AD-A113421) Avail: NTIS HC A02/MF A01 CSCL 13/8

The effects of false and incomplete identification of nonconforming items on the properties of two-stage acceptance sampling procedures are studied. Numerical tables are presented, and there is some discussion of sensitivity to inspection errors. Methods of taking into account extra costs needed to implement better inspection techniques, when initial grading is inconclusive, are described. Author (GRA)

N82-27759# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Mechanical Engineering.
FLAW DETECTION IN AUSTENITIC WELDS Final Report
George C. Johnson 14 Sep. 1981 27 p refs
(Contract W-7405-eng-48)
(DE82-001678; UCRL-15388) Avail: NTIS HC A03/MF A01

Estimating the size of the hole in an automatic weld was studied. It is suggested that the sizing problem can be resolved by imaging/reconstruction technique and that the geometry of the weld plays a dominant role in deciding what waves are to be used in the examination. For a weld with sides nearly vertical a wave at 45 was successful, since it propagated mainly through the parent plate. When sides of the weld are closer to 45 this has to pass through more of the weld material. It is found that the direct reflection signal is superior to the full-v reflection. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-27760# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
VARIABLE CROSS-SECTION SPACE-FRAME AND SHELL FINITE ELEMENTS
W. S. Doyle Apr. 1981 17 p refs Presented to the 3rd World Congr. on Finite Element Methods
(TR-817S) Avail: NTIS HC A02/MF A01

One and two dimensional quadratic isoparametric elements in which the cross-sectional dimensions can be varied within the element are discussed. The formulation of the element stiffness and mass matrices are described briefly. The importance of the locking phenomenon is examined and stress smoothing and evaluation is discussed. A number of examples are given to show the effectiveness and the characteristics of these variable depth elements for everyday problems. S.L.

N82-27761# Texas A&M Univ., College Station. Mechanics and Materials Center.
RESIDUAL STRESSES IN ADHESIVE JOINTS Final Report, 1 Jul. 1979 - 15 Aug. 1981
Y. Weitsman Wright-Patterson AFB, Ohio AFWAL Oct. 1981 235 p refs
(Contract F33615-79-C-5117; AF Proj. 2419)
(AD-A113601; AFWAL-TR-81-4121) Avail: NTIS HC A11/MF A01 CSCL 13/5

This final report contains several theoretical and experimental investigations related to the response of adhesives and adhesive joints due to mechanical and environmental effects. The theoretical investigations strive to highlight some of the features that are attributable to the time-dependent behavior of polymeric resins. These include a thermoviscoelastic analysis of residual stresses where it is shown that viscoelastic relaxation may reduce those stresses by about 20% and that the non-linear behavior tends to redistribute the stresses, reducing the magnitudes of stress concentrations as time progresses. An analysis of moisture effects indicates that under exposure to cyclic relative humidity the most severe states of stress may occur under partial drying rather than at the fully saturated case. Numerical schemes are provided to assist in computations of non-linear viscoelastic stresses and in determining moisture profiles under transient conditions. Experimental investigations are presented for the characterization of the time-dependent mechanical response of FM-73 unscrimmed adhesive at various levels of stress and temperature. The response is related by means of a non-linear viscoelastic constitutive relation. The results are restricted to a uni-directional case with limited damage growth. In addition, it was shown experimentally that the effects of cure shrinkage on residual

stresses are negligible whenever such shrinkage is not constrained against dilatational strain. Author (GRA)

N82-27762# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE DESIGN OF BEAMS ON WINKLER-PASTERNAK FOUNDATIONS FOR MINIMUM DYNAMIC RESPONSE AND MAXIMUM EIGENFREQUENCY
Sarp Adali Sep. 1981 36 p refs
(CSIR-TWISK-233) Avail: NTIS HC A03/MF A01

That cross sectional shape of a beam supported by a Winkler-Pasternak foundation is determined which will minimize the dynamic response of the beam or maximize its fundamental eigenfrequency. Here the dynamic response is defined either as the maximum dynamic deflection or the maximum dynamic normal stress when the beam is subject to a periodic dynamic load. To obtain the optimal designs, the methods of mathematical programming are employed, the area function being approximated by constant or linear splines on specified partitions. An iterative solution procedure is formulated that takes the form of successive steps of analysis and optimization, beginning with an initial guess. The effect of various problem parameters on the efficiency of the designs is investigated. Numerical results indicate that the existence of a shear layer, i.e., Pasternak foundation, as opposed to a Winkler foundation, decreases the efficiency of a minimum response design but increases that of a maximum eigenfrequency design. S.L.

N82-27763# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
VIBRATION DETECTION OF A TRANSVERSE CRACK IN A ROTATING MACHINE SHAFT
J. C. Sol 1982 16 p refs Transl. into ENGLISH from Mec., Mater., Electr. (France), no. 371/372, 1980 p 404-409
(ISSN-0077-5606; NRC/CNR-TT-2018) Avail: NTIS HC A02/MF A01

The vibrational effects of a crack are reviewed using simple theoretical models, and detection criteria for horizontal axle machines are defined. These criteria are compared with experimental results obtained using a small scale model and from a real machine. Monitoring techniques developed especially to detect defects of this type in turboalternators are then presented. S.L.

N82-27764# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
NONPRI: THE STATIC AND DYNAMIC ANALYSIS OF THREE DIMENSIONAL FRAMES USING NONPRISMATIC ELEMENTS
L. Resende and W. S. Doyle Jan. 1981 30 p refs
(TR-816S) Avail: NTIS HC A03/MF A01

A finite element streamlined for the analysis of variable cross section beam/frame members is presented and its practical application to static and free vibration problems is illustrated. The three dimensional beam element is formulated as isoparametric, straight, with variable cross section, with variable position of the internal node and accounts for linear material and linear geometric behavior only. The three moded element can account for shear as well as axial, flexual and torsional deformations making it suitable for thin and thick member analysis. The formulation allows degeneration of the space frame element to a transition element (moment transmission eliminated) and further to a pure cross element (axial effects only) making it useful for practical application. Author

N82-27765# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
NONPRI: AN EFFECTIVE NON-PRISMATIC THREE DIMENSIONAL BEAM FINITE ELEMENT
L. Resende and W. S. Doyle May 1980 22 p refs
(TR-794S) Avail: NTIS HC A02/MF A01

A computer procedure for the linear elastic static analysis of three dimensional skeletal structures using the NONPRI element is presented which is capable of analyzing shallow/deep as well as nonprismatic members. A simple quadratic isoparametric line element is used and the advantages derived from its use are highlighted. The modelling of structures using this element is discussed. Practical examples show the advantages of the element and results from other sources are given for comparison purposes. A.R.H.

N82-27766# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
A VARIABLE CROSS SECTION 3-D BEAM FINITE ELEMENT FOR STATIC AND FREE VIBRATION ANALYSES
L. Resende and W. S. Doyle Oct. 1980 38 p refs
(TR-806S) Avail: NTIS HC A03/MF A01

The development of a nonprismatic (variable cross section) 3-D beam finite element is discussed. The validity and advantages of the variable cross section formulation are investigated in the cases of static and free vibration analyses of structures consisting of members whose constitutive relationship is linear elastic. The formulation of the element is based on the quadratic isoparametric class of finite elements. The three noded element is versatile in that it can be used for thick as well as thin beam analysis. In the context of free vibration analysis, the effects of rotatory inertia and different mass matrix evaluation schemes are investigated. The solution algorithms employed are discussed. Numerical examples and results obtained from the developed computer program, NONPRI, are presented together with results from other sources for comparison purposes. M.G.

N82-27767# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
A REVIEW OF BENDING FINITE ELEMENTS WITH SPECIAL REFERENCE TO THE FORMULATION OF AN ISOPARAMETRIC NON-UNIFORM 3D BEAM ELEMENT
L. Resende and W. S. Doyle Jan. 1981 32 p refs
(TR-807S) Avail: NTIS HC A03/MF A01

Some concepts involved in the formulation of bending finite elements are reviewed. Special reference is made to the development of an isoparametric non-uniform 3D beam finite element for linear static and dynamic analysis. Advantages and problem areas inherent in this particular formulation are investigated. Other bending finite elements are also briefly discussed. Numerical examples and results are presented in order to illustrate important characteristics of the elements discussed. M.G.

N82-27768# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
PLANE STRESS/STRAIN ANALYSIS BY BOUNDARY INTEGRAL EQUATION AND FINITE ELEMENT METHODS
G. C. Howell and W. S. Doyle Mar. 1981 26 p refs
(TR-813S) Avail: NTIS HC A03/MF A01

The basis of the finite element method and the boundary integral equation method is derived from the basis differential equations by using a weighted residual technique. The resulting equations form the virtual work statement and the total potential energy of the system and are used to develop the numerical F E method. The BIEM is derived from an extended weighted residual equation which produces a reciprocal statement, known as the Betti-Somigliana formula. A set of known fundamental displacement and traction solutions, which satisfy the differential equation in the domain, are used to form a numerical technique involving only the boundaries. The numerical strategies employed are described and an example highlights the salient points concerning each method. S.L.

N82-27769# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
BOUNDARY INTEGRALS AN ALTERNATIVE TO FINITE ELEMENTS FOR PLANE ELASTICITY PROBLEMS
G. C. Howell and W. S. Doyle Jan. 1981 28 p refs
(TR-812S) Avail: NTIS HC A03/MF A01

The boundary integral equation method is discussed as it is applied to two dimensional elastostatic problems. The method is traced from the basic elasticity equations, through the integral formulation and into the numerical representation. Constant, linear and quadratic interpolation of the boundary values over the boundary segments are discussed. Internal stress and displacement fields are then calculated from the resulting solution. Examples are presented to show the advantages inherent in the method when it is used for design purposes. S.L.

N82-27770# Cape Town Univ. (South Africa). Dept. of Civil Engineering.

AXISYMMETRIC THIN SHELLS
A. R. Lloyd and W. S. Doyle Feb. 1981 32 p refs
(TR-811S) Avail: NTIS HC A03/MF A01

A finite element computer program for the static linear elastic analysis of variable thickness, branched axisymmetric thin shells uses meridionally curved rings in which the assumed displacements are described by polynomials involving generalized coordinates. Meridional and circumferential displacements are assumed to vary linearly, and radial displacements vary cubically along the length of the element. This shell is isotropic, in a condition of plane stress, and is assumed to obey Kirchhoff's theory. Strains and curvature changes are based on the strain displacement relation derived from the general theory of Novozhilov. Equilibrium equations are solved using the Cholesky factorization. General distributed and concentrated loading can be applied, as well as thermal loads. Nonaxisymmetric loads are approximated around the circumference using Fourier series for a number of harmonics. A solution is determined for each harmonic, and these are summed to give the solution for the full load conditions. Typical examples illustrate the method. Author

N82-27771# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
A RESUME OF BOUNDARY INTEGRAL METHODS (IN 2-DIMENSIONAL ELASTICITY)
G. C. Howell and W. S. Doyle [1982] 18 p refs
(TR-804S) Avail: NTIS HC A02/MF A01

The boundary integral method is a general technique for the solution of differential equations. It is assumed that the equations are elliptical in form and hence the solution discussed is parallelled by other methods, including the well known finite element method and finite difference method. The discussion of boundary integral methods leads initially to two distinct but equivalent methods of attack, viz. (1) The 'indirect' method, and (2) The 'direct' method. The indirect method is less rigorous than the direct method, but nevertheless is just as effective in most cases. It is based on the idea that the potential state within a particular domain is given by an unknown distribution of sources or dipoles (variables) over the boundary. The problem is solved in terms of the sources or dipoles by enforcing the boundary conditions at collocation points on the boundary. Numerically, this procedures a system of simultaneous equations (in general, nonsymmetric) which yield the distribution of the unknown variables. S.L.

N82-27772# Applied Science and Technology, Poway, Calif.
THE INTERAGENCY SOFTWARE EVALUATION GROUP: A CRITICAL EVALUATION OF THE ADINA, NASTRAN, AND STAGS STRUCTURAL MECHANICS COMPUTER PROGRAMS Final Report
Robert E. Nickell Dec. 1981 33 p refs
(Contract N00014-79-C-0620)
(AD-A110665; AST-81-2; TR-2) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report provides the summary for the first round of structural mechanics software evaluations by the Interagency Software Evaluation Group, consisting of the evaluation of the codes ADINA, NASTRAN, and STAGS. The evaluation criteria are discussed in some detail. Author (GRA)

N82-27773# National Materials Advisory Board, Washington, D. C.
CHARACTERIZATION OF ENVIRONMENTALLY ASSISTED CRACKING FOR DESIGN: STATE OF THE ART Final Report
1982 56 p refs
(Contract MDA903-78-C-0038)
(AD-A112061; NMAB-386) Avail: NTIS HC A04/MF A01 CSCL 20/11

High-strength structural alloys and weldments, such as those used in ship construction, can be exposed to deleterious environments under load and can experience environmentally assisted cracking (including stress-corrosion cracking and corrosion fatigue) during service. Designers cannot now anticipate with confidence a material's susceptibility to environmentally assisted cracking or determine how to characterize and incorporate such information in the design process (i.e., to quantitatively assess durability and reliability). Author (GRA)

N82-27774# Dayton Univ., Ohio.
FINITE ELEMENT TECHNIQUES FOR STATIC STRESS AND FREE VIBRATION ANALYSIS OF SANDWICH COMPOSITES Final Report, Sep. 1977 - Nov. 1980
Robert A. Brockman Wright-Patterson AFB, Ohio AFWAL Mar. 1981 63 p refs
(Contract F33615-77-C-3075; AF Proj. 2401)
(AD-A107095; UDR-TR-80-134; AFWAL-TR-81-3007) Avail: NTIS HC A04/MF A01 CSCL 13/13

Finite element solution techniques for stress and vibration analysis of layered sandwich panels are presented. The modeling approach considers each layer of the sandwich explicitly and can treat panels involving discrete stiffeners of two types. Static analyses of general sandwich panels can include mechanical and/or thermally-induced forces. Free vibration analysis is also considered. The associated computer program is suitable for operation at an interactive terminal, and includes provisions for automatic mesh generation and tabular output. Generated input and output data are in a form which may be accessed by existing computer graphics programs for plotting geometry and results. Sample analyses are presented to demonstrate the developed techniques. Author (GRA)

N82-27775# Dayton Univ., Ohio.
MINIMUM WEIGHT DESIGN OF FLAT SANDWICH PANELS UNDER EDGEWISE COMPRESSION LOADS Final Report, Sep. 1977 - Nov. 1980
Fred K. Bogner and M. L. Soni Wright-Patterson AFB, Ohio AFWAL Mar. 1981 56 p refs
(Contract F33615-77-C-3075; AF Proj. 2401)
(AD-A107096; UDR-TR-80-119; AFWAL-TR-81-3009) Avail: NTIS HC A04/MF A01 CSCL 13/13

An approach to the optimum design of flat, rectangular sandwich panels subjected to edgewise compression loading has been developed. Using a nonlinear programming method called the Sequential Unconstrained Minimization Technique, the design parameters characteristic of sandwich construction are determined so that the final panel configuration is not just an acceptable design, but is the best acceptable design as far as total panel weight is concerned. The design parameters are the individual thicknesses of the top and bottom face sheets and of the core, the cell size and foil thickness of honeycomb core, and the density of foam core. The acceptable ranges of the design parameters are limited by constraints which ensure, for example, that the thicknesses are within minimum and maximum limits, that the faces do not yield, wrinkle, or dimple, and that the panel does not buckle. Possible panel loads are edgewise compression in two directions. GRA

N82-27776# Clemson Univ., S.C.
EXPERIMENTAL AND NUMERICAL ANALYSIS OF AXIALLY COMPRESSED CIRCULAR CYLINDRICAL FIBER REINFORCED PANELS WITH VARIOUS BOUNDARY CONDITIONS Final Report, 1 Oct. 1978 - 30 Sep. 1981
Nelson R. Bauld, Jr. Wright-Patterson AFB, Ohio AFWAL Oct. 1981 155 p refs
(Contract F33615-79-C-3030; AF Proj. 2307)
(AD-A112725; AFWAL-TR-81-3158) Avail: NTIS HC A08/MF A01 CSCL 11/4

This report presents comparisons between the experimental and numerical buckling behaviors of fiber-reinforced, circular cylindrical panels under prescribed uniform end-displacements. Numerical predictions used in the comparisons were obtained from the energy-based, finite-difference computer program CLAPP. Test specimens were clamped along both curved edges and were either simply supported or unsupported along the straight edges. Author (GRA)

N82-27777# Massachusetts Inst. of Tech., Cambridge. Lab. for Mfg. and Productivity.
SURFACE TRACTION AND CRACK PROPAGATION IN DELAMINATION WEAR Final Report, Feb. 1978 - Sep. 1981
Nam P. Suh and Hyo-Chol Sin Nov. 1981 189 p refs
(Contract N00014-78-C-0252)
(AD-A112357; MIT/LMP/TRB-81-03) Avail: NTIS HC A09/MF A01 CSCL 20/11

The mechanisms of surface traction and crack propagation

and their functional relation to sliding wear are investigated experimentally and theoretically. According to the delamination theory of wear, the wear of materials strongly depends on friction because of the effect of surface traction on subsurface deformation and crack nucleation and propagation rates. Experimental studies using the cylinder-on-cylinder sliding arrangement with the iron based metals show that the coefficient of friction varies with the sliding distance and the environment. It is postulated that it is due to the changing contributions of three components of friction: due to the deforming asperities; plowing by wear particles and hard surface asperities; and adhesion. At any given loading contact only one of these mechanisms may operate and therefore, the local surface traction can vary from contact to contact, affecting the crack nucleation and propagation processes. The three mechanisms responsible for the generation of friction are analyzed using plasticity theory. The finite element analyses for the elastic and elastic-plastic solids with subsurface cracks indicate that the cracks in sliding wear propagate in a ductile manner. Such fracture parameters as the crack-tip sliding displacement and the fracture strain are found to be useful in characterizing crack propagation. GRA

N82-27778# Washington Univ., Seattle. Dept. of Mechanical Engineering.
DYNAMIC CRACK CURVING: A PHOTOELASTIC EVALUATION
M. Ramulu and A. S. Kobayashi Oct. 1981 32 p refs
(Contract N00014-76-C-0060; NR Proj. 064-478)
(AD-A107238; TR-41) Avail: NTIS HC A03/MF A01 CSCL 20/11

The objective of the present study is to derive a dynamic crack curving criterion applicable to both mode I and combined modes I and II crack tip deformation. To this goal, dynamic extension of two static crack curving criteria, that is the maximum circumferential stress criterion and the minimum strain energy density criterion at a critical distance rc, was considered. The developed theoretical relations were evaluated numerically and crack velocity on crack curving direction were deduced. Crack curving angles predicted by the two dynamic crack curing criteria were then compared with experimental results, obtained from past dynamic photoelastic investigation. GRA

N82-27779# Washington Univ., Seattle. Dept. of Chemistry.
ISOTOPE EFFECT IN GAS-SURFACE VIBRATIONAL ENERGY TRANSFER. CYCLOPROPANE AND CYCLOPROPANE-d6 ISOMERIZATION BY THE VEM TECHNIQUE
W. Yuan, R. Tosa, K.-J. Chao, and B. S. Rabinovitch 20 Oct. 1981 27 p refs Submitted for publication
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A107365; NR092-549-TR22) Avail: NTIS HC A03/MF A01 CSCL 20/11

The study of varying molecular structure on the efficiency of vibrational energy transfer between molecules and a hot surface has been extended to the pair, cyclopropane/cyclopropane-d6. The latter is less efficient in energy loss, as corresponds to the greater vibrational eigenstate density. Conversely, the probability of energy up-transitions is enhanced; in thermal low pressure unimolecular reactions this corresponds to the inverse statistical weight secondary isotope effect. Author (GRA)

N82-27780# Westinghouse Research and Development Center, Pittsburgh, Pa. Materials Engineering Dept.
APPLICATION OF ADVANCED FRACTURE MECHANICS TECHNOLOGY TO ENSURE STRUCTURAL RELIABILITY IN CRITICAL TITANIUM STRUCTURES Interim Report, 21 Nov. 1980 - 31 Mar. 1981
H. A. Ernst and J. D. Landes 15 Jun. 1981 37 p refs
(Contract N00014-80-C-0655)
(AD-A110778) Avail: NTIS HC A03/MF A01 CSCL 20/11

This report describes the progress in a program designed to assist the Navy in developing and applying advanced fracture mechanics technology to ensure structural reliability in critical applications of titanium alloys. Phase I of the program which was to gather information and data needed for applying advanced fracture mechanics technology to structural reliability analysis has been completed. The results of this phase are given in terms of a list of areas of concern which must be addressed in the future and a list of pertinent experimental work already completed or in progress. Phase II of this program will use the above information to conduct structural integrity analyses of specific models. A methodology for structural integrity analysis is presented both for general service conditions and accident conditions, which gives an general outline for conducting structural integrity analysis. The method will be applied to specific models supplied by the Navy. A final section of this report describes a method of design for assessing stable crack propagation under load control conditions. Author (GRA)

N82-27781# Denver Research Inst., Colo.
DETECTION OF MATRIX STRESSES IN GRAPHITE/EPOXY COMPOSITES BY X-RAY DIFFRACTION FROM CRYSTAL LINE FILLERS Final Report, 1 Mar. 1978 - 28 Feb. 1981
Paul K. Predecki and Charles S. Barrett Dec. 1981 36 p refs
(Grant AF-AFOSR-3284-77; AF Proj. 2306)
(AD-A112288; AFOSR-82-0174TR) Avail: NTIS HC A03/MF A01 CSCL 11/4

X-ray diffraction from graphite fiber/epoxy composite specimens containing fillers measures applied and residual stresses. Similarly, diffraction from filled epoxy painted on specimens measures applied stresses. Both methods indicate moisture content. Both methods measure the stress distribution in the adherends of adhesive bonds, and a modification could also apply to the stresses in the adhesive. Author (GRA)

N82-27782# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.
THE DYNAMIC DESIGN-ANALYSIS METHOD (DDAM) IN NASTRAN Final Report, Jun. - Nov. 1980
Myles M. Hurwitz Oct. 1981 26 p refs
(S0923001)
(AD-A107074; DTNSRDC-81/073) Avail: NTIS HC A03/MF A01 CSCL 13/3

This report describes the theory, implementation, and use of the Dynamic Design-Analysis Method (DDAM) in the NASTRAN finite element structural analysis computer program. DDAM is the procedure used in the shock design of shipboard equipment. Since such equipment is also frequently analyzed with NASTRAN, the inclusion of DDAM in NASTRAN greatly enhances the efficiency of the design-analysis process. Author (GRA)

N82-27783# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NONLINEAR BENDING OF BIMODULAR MATERIAL PLATES Interim Report
J. N. Reddy and W. C. Chao Jan. 1982 25 p refs
(Contract N00014-78-C-0647; NR Proj. 064-609)
(AD-A113850; VPI-E-82.2; TR-25) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper presents finite element results for geometrically nonlinear response of fiber-reinforced, single-layer and two-layer cross-ply rectangular plates constructed of materials whose linear elastic properties in tension and compression are different. A shear deformation theory of layered composite plates, accounting for large rotations (in the von Karman sense) and the bimodular action, is employed to analyze rectangular plates made of two cord-rubber bimodular materials. Numerical results for transverse deflection are presented for simply supported plates under sinusoidally distributed and uniformly distributed transverse loads. GRA

N82-27784# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
MECHANICAL PROPERTY CHARACTERIZATION AND MODELING OF STRUCTURAL MATERIALS Final Report, Jun. 1979 - May 1981
Noel E. Ashbaugh, Henry L. Bernstein, Bhaskar Majumdar, and Jalees Ahmad Wright-Patterson AFB, Ohio AFWAL Feb. 1982 132 p refs
(Contract F33615-79-C-5025; AF Proj. 2307)
(AD-A113841; SRL-9799; AFWAL-TR-81-4187) Avail: NTIS HC A07/MF A01 CSCL 11/4

The crack growth behavior of engine disk nickel base superalloys operating in the temperature range 538-760 C was investigated. The effects of sustained load upon crack growth, crack growth in deleterious environments, and crack initiation and growth of short cracks were emphasized. Crack growth rate

models were developed based upon experimental results and upon analytical characterization of fundamental processes which occur during crack growth. Mechanical property data were generated from tests including uniaxial tension, compression, bend, creep fatigue, low cycle fatigue, crack initiation, sustained load crack growth, and fatigue crack growth. The materials tested included nickel base superalloys, titanium, aluminum, and other structural materials. GRA

N82-27785# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Reference Systems Branch.
A DIGITAL COMPUTER APPROACH TO THE UNSYMMETRIC RIGID BODY PROBLEM M.S. Thesis Final Report, Jan. 1979 - Apr. 1981
Richard W. Jacobs Mar. 1982 67 p refs
(AD-A113572; AFWAL-TR-81-1245) Avail: NTIS HC A04/MF A01 CSCL 20/11

The use of a computer approximation technique based on trial functions is investigated for the integration of the Euler equations of motion for a general rigid body rotating about a fixed point. The collocation method is evaluated against a Runge Kutta method for several cases consisting of various moments of inertia and applied torques. The collocation method includes two and four term polynomial trial functions which represent the angular velocities of the rigid body over intervals of time. The results of the methods are evaluated graphically against two known solutions and five other cases. The collocation method yields superior results to the Runge Kutta method. Author (GRA)

N82-27786# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
STUDY OF RESIDUAL STRESSES AND DISTORTION IN STRUCTURAL WELDMENTS IN HIGH STRENGTH STEEL Interim Report, 1 Dec. 1980 - 30 Nov. 1981
Vassilios J. Papazoglou and Koichi Masubuchi 30 Nov. 1981 142 p refs
(Contract N00014-75-C-0469)
(AD-A113613; TPR-3) Avail: NTIS HC A07/MF A01 CSCL 11/6

Numerical analyses based on the finite element method for the prediction of temperatures, thermal strains, and residual stresses due to welding and of the fracture characteristics of weldments are detailed. The obtained results are compared with experimentally obtained data from butt welding 1 in thick HY-130 steel plates using the gas metal arc process. Experimental results on the effects various welding parameters have on the welding distortion of Nickel-Aluminum bronze thin weldments are also included. Optimum welding procedures are then proposed. Finally, initial efforts toward studying the thermal stress relieving operation are outlined. They include a simple mathematical model for the description of the phenomena involved and a series of experiments. Author (GRA)

N82-27787# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
EFFECT OF GRADIENTS IN MULTI-AXIAL STRESS STATES ON RESIDUAL STRESS MEASUREMENTS WITH X-RAYS
I. C. Noyan 30 Mar. 1982 35 p refs Sponsored in part by a NATO grant
(Contract N00014-80-C-0116)
(AD-A113752; TR-6) Avail: NTIS HC A03/MF A01 CSCL 20/3

The assumption, that stress components in the direction of the surface normal are negligible in traditional residual stress determination methods by X-rays, has been recently disapproved. In this paper we investigate the effect of normal stresses on the accuracy of these traditional methods. It is shown that appreciable error can exist in surface stresses determined by such methods, if normal stresses are present. New procedures are proposed to minimize these errors. Author (GRA)

N82-27788# Stanford Univ., Calif. Div. of Applied Mechanics.
STRESS ANALYSIS FOR KINEMATIC HARDENING IN FINITE-DEFORMATION PLASTICITY Final Report, 1 Jul. - 1 Dec. 1981
E. H. Lee, R. L. Mallett, and T. B. Wertheimer Dec. 1981 36 p refs
(Contract N00014-81-K-0660; NR Proj. 064-664)
(AD-A113525; SU-DAM-81-11) Avail: NTIS HC A03/MF A01 CSCL 20/11

Kinematic hardening represents the anisotropic component of strain hardening by a shift, alpha, of the center of the yield surface in stress space. The currently adopted approach in stress analysis at finite deformation accounts for the effect of rotation by using Jaumann derivatives of alpha and the stress. This analysis generates the unexpected result that oscillatory shear stress is predicted for monotonically increasing simple shear strain. Simple shear strain growing at constant rate gamma dot = k yields a spin in the plane of shearing having the constant magnitude k/2. The effect of this on the evolution equation for the shift tensor alpha causes the latter to rotate continuously. In contrast, the kinematics of simple shear prescribe that no material directions rotate by more than pi radians. These two features seem inconsistant since the shift tensor has its origin embeddded in the material, for example as rows of dislocations piled up against grain boundaries. By defining a modified Jaumann derivative based on the angular velocity of directions embedded in the body which characterize the effective resultant orientation of the micromechanisms responsible for the anisotropic hardening, a method of stress analysis is implemented which eliminates the inconsistency and yields a monotonically increasing shear stress. Author (GRA)

N82-27789# Rome Air Development Center, Griffiss AFB, N.Y.
METHODS OF MEASURING AND ESTABLISHING CABLE TENSIONS IN GUYED STRUCTURES Report, May - Sep. 1981
William J. Bocchi and Nicholas G. Forlenza Jan. 1982 74 p refs
(AF Proj. 2114)
(AD-A112953; RADC-TR-81-392) Avail: NTIS HC A04/MF A01 CSCL 13/9

This report describes in detail, three methods of measuring cable tensions on guyed structures. The methods are sag, deflection tensiometer, and vibration. A field comparison of each method was made using the guyed structures at RADC's Stockbridge Test Site. The vibration technique was conceived several years ago for a previous effort and was verified as an accurate and practical method to measure guy cable tensions. Also included in this report is a complete documentation of the cables used on all guyed structures at the Stockbridge Test Site and the results of the cable tension measurements performed for this effort. Author (GRA)

N82-27790# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
IDENTIFICATION OF FLAWS RESPONSIBLE FOR CRACK INITIATION AND MICROMECHANISMS OF SLOW CRACK GROWTH IN THE DELAYED FRACTURE OF ALUMINA Final Report, 1 Aug. 1977 - 31 Dec. 1981
George Sines and Tatsuo Okada Feb. 1982 232 p refs
(Grant AF-AFOSR-3425-77; AF Proj. 2306)
(AD-A113012; AFOSR-82-0225TR) Avail: NTIS HC A11/MF A01 CSCL 11/5

An eccentrically loaded column testing system was developed to produce a number of crack initiations on the surface of an alumina specimen. Using a specially developed fluorescent dye penetration technique, direct observations of early stages of crack extension from inherent flaws were made in the testing system. It was found that a larger number of inherent flaws exist on the surface of a ceramic and can, by themselves or as assemblies, become potential crack origins. Cracking sites were found to be multiple in delayed fracture. The initial stage of delayed fracture was shown to involve the interaction and coalescence of near-by flaws with extensive intergranular cracking. A model for the delayed fracture, the microscopic slow crack growth and crack interaction and coalescence was proposed. The model gives much better prediction of fracture times than does the conventional single-worst-crack approach. It was found that an assembly of microscopic cracks, which may not be observable, can be much more dangerous than a single macroscopic crack in delayed fracture and that the coalescence of the microscopic cracks may occur in a very short time without being identified because a critical amount of slow crack growth

from the individual inherent flaws can be very small.
Author (GRA)

N82-27791# Florida Univ., Gainesville. Dept. of Engineering Sciences.
STUDIES ON THE FRACTURE MECHANISMS IN PARTIALLY PENETRATED FILAMENT REINFORCED LAMINATED PLATES
R. L. Sierakowski, C. A. Ross, L. E. Malvern, and H. W. Doddington 30 Jan. 1982 49 p refs
(Grant DAAG29-79-G-0007)
(AD-A113249; TR-1; ARO-15987.8-E) Avail: NTIS HC A03/MF A01 CSCL 11/4

The overall objective of this research program has been to obtain information on the fracture mechanisms occurring in centrally impacted composite plates in order to establish design guidelines for plates to resist such impacts. A three dimensional orthotropic-material elastic analysis was performed to calculate the interlaminar shear stress in a (0 deg sub 5/90 deg sub 5/0 deg sub 5) glass/epoxy plate under central loading simulating a center point normal impact at 45.7 m/s (150 ft/sec) by a steel cylinder of diameter 9.7 mm and length 25.4 mm. The calculation was performed with the SAP IV finite-element computer code. Results indicated a considerable region where the estimated interlaminar shear strength was exceeded. Thus delamination would be expected to occur, as experimental studies have confirmed. The experimental delaminated areas do not correlate directly with the areas where the shear strength was exceeded in the elastic solution, because the stress distribution is altered during the delamination, which was not accounted for in the elastic solution. GRA

N82-27792# Maryland Univ., College Park. Dept. of Mathematics.
GLOBAL NONEXISTENCE OF CLASSICAL SOLUTIONS IN ONE-DIMENSIONAL NONLINEAR VISCOELASTICITY
Frederick Bloom Jan. 1982 23 p refs Prepared in cooperation with South Carolina Univ.
(Grant AF-AFOSR-0171-81; AF Proj. 2304)
(AD-A113022; MD82-3-FB; AFOSR-82-0270TR; TR-82-2) Avail: NTIS HC A02/MF A01 CSCL 20/11

Results are presented which show that smooth global solutions of the one-dimensional nonlinear viscoelasticity initial-boundary value problem cannot exist in the smoothness. The physical implication is that in the deformation of a nonlinear viscoelastic bar a shock will develop if the initial displacement is sufficienty small but has a sufficiently large gradient.
Author (GRA)

N82-27793# Studsvik Energiteknik A.B., Nykoping (Sweden).
FRACTURE TOUGHNESS DETERMINATION OF THE PRESSURE VESSEL STEEL A508 CL 2 BETWEEN 100 AND 350 DEG C
S. Rao Sep. 1980 40 p refs
(STUDSVIK-E1-80-85) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The fracture toughness of the pressure vessel steel A508 was determined in the temperature range 100 to 350 C. The J integral method with crack growth resistance curves, R curves, was used. The results show that the steel does not have an 'upper shelf' and the fracture toughness, K sub JC, decreases with increasing temperature to a minimum around 300 C and an increase above it. These results are compared to those obtained previously on an other pressure vessel steel A533B which has essentially the same temperature dependence. The results were also analysed using the tearing modulus, T. The conclusion is that the crack growth resistance and the crack initiation resistance (K sub JC) show a significant decease around the operating temperatures as compared to 100 C. DOE

N82-27794# Central Electricity Generating Board, Southampton (England). Engineering Labs.
CREEP RUPTURE PROPERTIES OF AUSTENITIC AND NICKEL-BASED TRANSITION JOINTS
R. D. Nicholson Jun. 1981 26 p refs
(DE82-901098; RD/M-1176N81) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Four simple vee butt welds were made in 2-1/4 Cr1Mo steel plate using either AISI Type 316 or Inconel 182 filler metals and cross-weld specimens were machined from each weld. Iso-stress, temprature acceleration tests were used to produce low ductility interfacial failures in the specimens from each weld. The fracture morphology was studied by optical and scanning electron microscopy. A change in the short and long term fracture mechanism of nickel-based joints is identified, which limits the general applicability of the present data. The interfacial damage was measured and is used to discuss the relative importance in controlling fracture of creep strength and thermal expansion coefficient differences between the weld metal and ferritic steel. DOE

N82-27795# British Aerospace Aircraft Group, Preston (England).
SIMPLIFYING THE TASK OF ANALYSING NASTRAN COMPUTER RESULTS
E. S. Hardman, D. Caborn, P. Titcombe, and E. H. Green Feb. 1982 17 p
(BAe-SON(P)-282) Avail: NTIS HC A02/MF A01

Present methods of using the NASTRAN structural analysis capability are reviewed. Factors which determine the type and scale of an analysis are discussed together with the influence which these early decisions have on the ultimate case, or otherwise, with which the results are interpreted. Output diagnostics are required to determine if a valid solution is obtained and advice is given on the checks which should be made to ensure that significant errors are not present. The range of output options is explored and the pros and cons of different media are listed along with advice on how to keep unnecessary output to a minimum. Ways in which the data preparation and output interpretation phases can be progressively automated, thereby reducing the labor intensive nature of this activity, are suggested. Author (ESA)

N82-27796# Texas Univ., Austin. Center for Transportation Research.
ANALYTICAL STUDY OF THE FATIGUE BEHAVIOR OF A LONGITUDINAL TRANSVERSE STIFFENER INTERSECTION
Interim Report
D. A. Platten, K. H. Frank, and J. A. Yura Aug. 1981 240 p refs Sponsored by DOT and Texas State Dept. of Highways and Public Transportation
(PB82-141383; CTR-3-5-79-247-1; FHWA/TX-81-24-247-1) Avail: NTIS HC A11/MF A01 CSCL 13B

The fatigue life of the intersection of a longitudinal and transverse stiffener was estimated using the principles of fracture mechanics. A quarter section of a stiffened girder was analyzed using a three dimensional finite element representation. The intersection area was then studied in detail using a refined two dimensional mesh to determine the stress distribution through the web. The estimate of the stress intensity factor for a crack at the intersection location was estimated using a Green's function approach. The results indicate that due to the proximity of the weld toes of the two stiffeners, one-half inch in the girder studied, the fatigue life of this detail is lower than the E prime detail of the AASHTO Specifications. The most practical means of increasing the fatigue life is increasing the gap to a minimum of 4 and a maximum of 6 times the web thickness. These are the same requirements for the end of a transverse stiffener.
GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-27797# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXPOSING OBJECTS UNDER LIGHT CLOUD COVER BY ADAPTIVE HOMOMORPHIC FILTERING
Tamar Peli and Thomas F. Quatieri 6 Jan. 1982 47 p refs
(Contract F19628-80-C-0002; AF Proj. 4594)
(AD-A112338; TR-587; ESD-TR-81-363) Avail: NTIS HC A03/MF A01 CSCL 05/8

In this report, we demonstrate the use of adaptive homomorphic filtering in exposing objects under light cloud cover. More specifically, the homomorphic filter invoked is space-varying and is parameterized by the local mean level of the degraded image which serves as an indication of the extent of local cloud cover degradation. We show through some preliminary experiments that this approach compares favorably with long space methods such as deterministic and stochastic homomorphic filtering and an iterative version of stochastic homomorphic filtering.
Author (GRA)

N82-27798# Geokinetics, Inc., Salt Lake City, Utah.
INVESTIGATION OF THE GEOKINETICS HORIZONTAL IN SITU OIL SHALE RETORTING PROCESS Quarterly Report, Jul. - Sep. 1981
J. R. Gilbert Nov. 1981 30 p refs
(Contract DE-FC20-78LC-10787)
(DE82-004273; DOE/LC-10787/86) Avail: NTIS HC A03/MF A01

The development of an in-situ process for recovering shale oil is reported. A retort No. 26 was loaded with explosives on August 5 and 6. On August 7, retort No. 26 was detonated. The retort No. 26 blast was was highly successful. Following the blast of retort No. 26 preparations are made for the ignition of retort No. 25. Equipment and piping were set in place and the instrumentation systems were wired in. Ignition for retort No. 25 is scheduled for mid to late October 1981. The retort No. 26 Postblast coring program continues. With the ignition of retort No. 25 the anaytical lab began constant monitoring of the retort burn. DOE

N82-27799# GeoEnergy Corp., Las Vegas, Nev.
DEVELOPMENT OF TECHNIQUES FOR OPTIMIZING SELECTION AND COMPLETION OF WESTERN TIGHT GAS SANDS, PHASES 1 THROUGH 8 Summary Report, Nov. 1978 - Sep. 1981
C. F. Knutson Sep. 1981 14 p refs
(Contract DE-AC08-79BC-10005)
(DE82-004226; DOE/BC-10005/7) Avail: NTIS HC A02/MF A01

Selection and completion of western tight gas sands is outlined in six phases. Phase 1 points out the similarity between the fluvial Cretaceous Farrer Formation and the fluvial Cretaceous Cedar Mountain Formation in East Central Utah. Phase 2 indicates a difference in the characteristics of the small scale paleo-current indicators between the fluvial Farrer beds and the Castlegate marine, the Sego marine marginal and the Wasatch (Green River) lacustrine and marginal lacustrine beds. Phase 3 presents a qualitative correlation of geophysical log, core and outcrop information from the GC-1 area in Grand County, Utah. Phase 4 continues studies previously made in the Western Piceance and Eastern Uinta Basins to the Green River and Wind River Basins of Wyoming. Phase 5 summarizes a characterization of some of the Cretaceous and Paleozoic fluvial beds in the Green River and Wind River Basins. Phase 6 presents the results of a study of the Rifle Gap area in Colorado and prognosis of the reservoir geometric characteristics of the fluvial Mesaverde target section at the multiwell experiment site. DOE

N82-27800# GeoEnergy Corp., Las Vegas, Nev.
DEVELOPMENT OF TECHNIQUES FOR OPTIMIZING SELECTION AND COMPLETION OF WESTERN TIGHT GAS SANDS: COMPARISON OF CORE, GEOPHYSICAL LOG AND OUTCROP INFORMATION. PHASE 3 REPORT Technical Report, May 1979 - Aug. 1981
C. F. Knutson and I. T. Hodges Aug. 1981 158 p refs
(Contract DE-AC08-79BC-10005)
(DE82-001126; DOE/BC-10005/3) Avail: NTIS HC A08/MF A01

A corehole, DOE/GC-1, was drilled from a ridge location in the Westwater Canyon area of the Book Cliffs, Grand County, Utah. The well encountered Tuscher, Farrer and Neslen beds. These units were also exposed in outcrops on the ridge sides. The general dip direction of the beds in the GC-1 area is about 2000 and the tip angle is about 50. The sandstone lenses observed in outcrop contained numerous small scale sedimentary structures. The median height of these structures was: Farrer 0.7 ft, Neslen 0.9 ft, and Tuscher 0.9 ft. The inclination was: Farrer 150, Neslen 140, and Tuscher 120. The average trend of the Farrer sandstone lenses was 640, and the median apparent length/height ratio of the Farrer outcrops was 35. The GC-1 well was cored from about 33 ft to 1010 ft with 98+% recovery. An orienting assembly was used to core from 770 to 950 ft. Only a limited amount of actual orientation information was retrieved due to repeated equipment failure. DOE

N82-27801# Engineers International, Inc., Downers Grove, Ill.
INVESTIGATION OF PROBLEMS AND BENEFITS OF UNDERGROUND MULTIPLE SEAM COAL MINING Final Technical Report
Madan M. Singh and Michael F. Dunn Washington DOE Oct. 1981 325 p refs
(Contract DE-AC01-79ET-14242)
(DE82-002807; DOE/ET-14242/T2) Avail: NTIS HC A14/MF A01

It is estimated that over 156 billion tons of coal in the United States are amenable to multiple-seam mining. However, currently most operations mine only a single seam, and in the past indiscriminate practices have sterilized large amounts of coal in contiguous seams. In the interests of conservation, it is imperative that procedures be followed that enhance resource recovery. The total life-cycle costs of mining are site specific because of the wide variations in land acquisition costs, capital expenditures, resource recovery, labor productivity, and geological conditions. However, under similar circumstances the costs of single- and multiple-seam mining are within 5 percent, using the best available technology. Improvements in present methods could lower costs of multiple-seam mining further, making it more competitive. Ground control (entailing roof support, bumps, and subsidence) is the most important technical problem encountered in multiple-seam mining, mainly caused by remnant pillars. DOE

N82-27802# Tennessee Valley Authority, Chattanooga. Office of Natural Resources.
REMOTE SENSING OF SULFUR DIOXIDE EFFECTS ON VEGETATION. VOLUME 1: SUMMARY Final Report
C. Daniel Sapp Jul. 1981 31 p 2 Vol.
(Contract EPA-IAG-D8-E721)
(DE82-900580; TVA/ONR/ARP-81/5-Vol-1;
EPA-660/7-81-113) Avail: NTIS HC A03/MF A01

Three techniques for detecting and mapping sulfur dioxide (SO2) effects on the foliage of sensitive crops and trees near large, coal-fired power plants were tested and evaluated: spectroradiometry, photometric analysis of aerial photographs, and computer analysis of airborne multispectral scanner data. DOE

N82-27803# Tennessee Valley Authority, Chattanooga. Office of Natural Resources.
REMOTE SENSING OF SULFUR DIOXIDE EFFECTS ON VEGETATION. VOLUME 2: DATA Final Report
C. Daniel Sapp Jul. 1981 280 p refs 2 Vol.
(Contract EPA-IAG-D8-E721)
(DE82-900581; TVA/ONR/ARP-81/6-Vol-2;
EPA-600/7-81-114) Avail: NTIS HC A13/MF A01

Airborne multispectral scanner data covering affected soybean fields were analyzed using three computer-assisted procedures: unsupervised, supervised, and pseudosupervised. The last method provided the best results. LANDSAT imagery was also investigated,

but the foliar effects of SO2 were too subtle to detect from orbit. DOE

N82-27804# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: NORTH/SOUTH TIELINE, VOLUME 1 Final Report
May 1981 38 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005542; GJBX-386-81-Vol-1) Avail: NTIS HC A03/MF A01

An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted along the 990 longitude meridian from the Canadian border southward to the Mexican border. A total of 1555 line miles of geophysical data were acquired. The program acquires and compiles geologic and other information to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States. DOE

N82-27805# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: NORTH/SOUTH TIELINE, VOLUME 2 Final Report
May 1981 108 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005570; GJBX-386-81-Vol-2) Avail: NTIS HC A06/MF A01

Data from an airborne high sensitivity gamma-ray spectrometer and magnetometer survey along the 990 longitude meridian from the Canadian border southward to the Mexican border are presented. The purpose of this study is to acquire and compile geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the US. DOE

N82-27806# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SIOUX FALLS QUADRANGLE, SOUTH DAKOTA, VOLUME 1 Final Report
May 1981 99 p refs Sponsored in part by Bendix Field Engineering Corp. 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005533; GJBX-389-81-Vol-1) Avail: NTIS HC A05/MF A01

Computer printer maps of the magnetic total intensity and the six radiometric parameters were prepared in addition to the radiometric anomaly maps for this area. The magnetic total intensity map displays a rather subdued response pattern of broad low amplitude anomalies over much of the area with an average magnetic intensity of approximately 58,900 gammas. The radiometric response over much of the area is relatively low. Equivalent concentrations of uranium, thorium and potassium only rarely exceed 3.2 ppM, 7.5 ppM and 1.4% respectively. A number of these zones of increased concentrations show corresponding anomalous responses on the uranium/potassium and/or uranium/thorium pseudo-contour maps. Based on this set of computer printer maps alone however, it is, at times, difficult to discern the contribution of coinciding local decreases in the potassium and thorium parameters to these ratio anomalies. Based on the criteria stated in the general section on interpretation, a total of seven uranium and seven thorium anomalies were outlined on the interpretation map. DOE

N82-27807# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SIOUX FALLS QUADRANGLE, SOUTH DAKOTA, VOLUME 2 Final Report
May 1981 132 p Sponsored in part by Bendix Field Engineering Corp. 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005574; GJBX-389-81-Vol-2) Avail: NTIS HC A07/MF A01

The flight path, radiometric multiparameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, and anomaly maps for the Sioux Falls Quadrangle in South Dakota are presented. These data are used to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium. DOE

N82-27808# Texas Univ., El Paso. Dept. of Geological Sciences.
EVALUATION AND COMBINED GEOPHYSICAL INTERPRETATIONS OF NURE AND RELATED GEOSCIENCE DATA IN THE VAN HORN, PECOS, MARFA, FORT STOCKTON, PRESIDIDO, AND EMORY PEAK QUADRANGLES, TEXAS, VOLUME 1 Final Report
G. R. Keller, W. J. Hinze, C. L. V. Aiken, P. C. Goodell, R. F. Roy, and N. E. Pingitore Sep. 1981 451 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005554; GJBX-365-81) Avail: NTIS HC A20/MF A01

The six Trans-Pecos Texas quadrangles (Van Horn, Pecos, Marfa, Port Stockton, Presidio, and Emory Park) were surveyed. The aeromagnetic gravity and geochemical data, their processing, and their analysis are discussed. The geologic history and setting of the Trans-Pecos are discussed along with the uranium potential of the region. Uranium anomalies and occurrences are present in the study area, and information is presented on 33 drill holes into these targets. A folio of maps reduced to a scale of 1:500,000. Geologic maps for each of the six quadrangles are included and the geophysical maps have been prepared to be overlays for the geologic maps. Residual aeromagnetic anomaly, complete Bougner gravity anomaly, flight line index, gravity station index, and anomaly interpretative maps were prepared for each quadrangle. A large suite of digitally processed maps of gravity and aeromagnetic are included. DOE

N82-27809# Texas Univ., El Paso. Dept. of Geological Sciences.
EVALUATION AND COMBINED GEOPHYSICAL INTERPRETATIONS OF NURE AND RELATED GEOSCIENCE DATA IN THE VAN HORN, PECOS, MARFA, FORT STOCKTON, PRESIDIO, AND EMORY PEAK QUADRANGELS, TEXAS Final Report
G. R. Keller, W. J. Hinze, C. L. V. Aiken, R. C. Goodell, R. F. Roy, and N. E. Pingitore Sep. 1981 88 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-005560; GJBX-365-81-Vol-2) Avail: NTIS HC A05/MF A01

An atlas containing the geophysical data publicly available in the Van Horn, Pecos, Marfa, Fort Stockton, Presidio, and Emory Peak quadrangles and a major file of basic data which are the object of much industrial interest is presented. Narrative discussion of the maps and contour maps of the aeromagnetic and gravity data, as well as maps of flight path recovery and gravity station locations are included. Geologic maps, key radiometric data, and ground truth sample location and data are also displayed. A scale of 1:500,000 is employed so that the maps can be overlain for qualitative comparisons. The maps refer to the qualitative analysis, particularly the interpretative anomaly index maps. DOE

N82-27810# Carson Helicopters, Inc., Perkasie, Pa.
NURE AERIAL GAMMA-RAY AND MAGNETIC RECONNAISSANCE SURVEY OF PORTIONS OF NEW MEXICO, ARIZONA AND TEXAS. VOLUME 2: NEW MEXICO-CARLSBAD QUADRANGLE Final Report
Sep. 1981 184 p refs Prepared for Bendix Field Engineering Corp.
(Contract DE-AC13-76GJ-01664)
(DE82-005527; GJBX-412-81-Vol-2C) Avail: NTIS HC A09/MF A01

A rotary wing high sensitivity radiometric and magnetic survey was flown covering the Carlsbad Quadrangle of the State of New Mexico. The survey was flown with a Sikorsky SS8T helicopter equipped with a high sensitivity gamma ray spectrometer and the dynamic test range at Lake Mead, Arizona. Instrumentation and data reduction methods are presented in Volume I of this report. The reduced data is presented in the form of stacked profiles, standard deviation anomaly plots, histogram plots and microfiche listings. The results of the geologic

interpretation of the radiometric data together with the profiles, anomaly maps and histograms are presented in this Volume II final report. DOE

N82-27811# Bendix Field Engineering Corp., Grand Junction, Colo.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: SUSANVILLE QUADRANGLE, CALIFORNIA, VOLUME 1 Final Report
May 1981 115 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-005538; GJBX-410-81-Vol-1) Avail: NTIS HC A06/MF A01

An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted over ten areas over northern California and southwestern Oregon. These include the 20 x 10 NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukian, and Chico along with the 10 x 30 areas of the Coos bay quadrangle and the Crescent City/Eureka areas combined. Traverse lines were flown in an east-west direction at a line spacing of six (6) miles. The lines were flown north-south approximately eighteen (18) miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled, and interpreted during the survey, of which 1642.8 line miles are in this quadrangle. Geologic and other information with which to assess the magnitude and distributing of uranium resources and to determine areas favorable for the occurrence of uranium in the United States were computed. Author

N82-27812# Bendix Field Engineering Corp., Grand Junction, Colo.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: ROSEBURG QUADRANGLE, OREGON, VOLUME 2 Final Report
Mar. 1981 134 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-005568; GJBX-388-81-Vol-2) Avail: NTIS HC A07/MF A01

Data from an airborne high sensitivity gamma ray spectrometer and magnetometer survey of the Roseburg quadrangle, Oregon are presented. The magnitude and distribution of uranium resources and favorable areas for occurrence of uranium in the US are discussed. DOE

N82-27813# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: UKIAH QUADRANGLE, CALIFORNIA, VOLUME 1 Final Report
May 1981 110 p refs Sponsored in part by Bendix Field Engineering Corp. 2 Vol.
(Contract DE-AC13-79GJ-01664)
(DE82-005541; GJBX-390-81-Vol-1) Avail: NTIS HC A06/MF A01

Transverse lines were flown in an east to west direction at a line spacing of six miles. Tie lines were flown north to south approximately eighteen miles apart. A total of 16,880.5 line miles of geophysical data were acquired, compiled and interpreted during the survey, of which 1517 line miles are in this quadrangle. Geologic and other information was compiled with which to assess the magnitude and distribution of uranium in the United States. DOE

N82-27814# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: HURON QUADRANGLE SOUTH DAKOTA Final Report
Apr. 1981 98 p refs Prepared for Bendix Field Engineering Corp.
(Contract DE-AC13-76GJ-01664)
(DE82-005540; GJBX-405-81-Vol-1) Avail: NTIS HC A05/MF A01

Geologic and other information with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States were acquired. An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted over eleven 20 x 10 NTMS quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 NTMS quadrangles in North and South Dakota. The quadrangles located within the North and South Dakota survey area include Devil's Lake, New Rockford, Jamestown, Aberdeen, Huron, Mitchell, and Sioux Falls. The results obtained over the Huron map area are discussed. Traverse lines were flown in an east-west direction at a line spacing of six miles. The lines were flown north-south approximately 24 miles apart. DOE

N82-27815# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: CHICO QUADRANGLE CALIFORNIA Final Report
May 1981 127 p refs Prepared for Bendix Field Engineering Corp.
(Contract DE-AC13-76GJ-01664)
(DE82-005543; GJBX-407-81-Vol-1) Avail: NTIS HC A07/MF A01

The magnitude and distribution of uranium resources with which to assess the magnitude and distribution of uranium resources and to determine areas favorable for the occurrence of uranium in the United States was investigated. An airborne high sensitivity gamma ray spectrometer and magnetometer survey was conducted over 10 areas over northern California and southwestern Oregon. These include the 20 x 10 NTMS quadrangles of Roseburg, Medford, Weed, Alturas, Redding, Susanville, Ukian, and Chico along with the 10 x 20 areas of the Coos Bay quadrangle and the Crescent City/Eureka areas combined. The results obtained over the Chico, California, map area are discussed. DOE

N82-27816# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.
MOVEMENT OF ICE MARKERS MEASURED BY SATELLITE RANGING
Preben Gudmandsen, Christen Carle, and Jens Maaloee Paris ESA Jun. 1981 82 p refs
(Contract ESA-4634/81)
(R-240; ESA-CR(P)-1547) Avail: NTIS HC A05/MF A01

A method for determining the surface velocity of large ice sheets in Greenland and Antarctica involves measuring the change of distance between fixed markers and those on ice sheets, using ERS-1 for altimetry and radar ranging. An acceptable signal to noise ratio can be obtained with the ERS-1 high gain antenna and a marker, consisting of a square trihedral corner reflector, with side length = 1.5 m, radar cross section 55 dB. The high gain antenna limits the area investigated to an 18 km swath, assuming a 5 deg incidence angle. A Swerling type radar cross section of the corner reflector results in a 62% detection probability for 6-pulse integration. Displacement of markers can only be measured at crossing ground tracks when the satellite is operated in a rigid orbit mode, i.e., a 20 X 20 km area. Accuracy of 78 cm is possible. Author (ESA)

N82-27817# Illinois State Water Survey, Champaign.
THREE-DIMENSIONAL GEOLOGIC MAPPING FOR ENVIRONMENTAL STUDIES IN ILLINOIS
John P. Kempton Oct. 1981 49 p refs Sponsored in part by Illinois Inst. of Natural Resources, Springfield
(PB82-138843; IL/SGS-ENG-100) Avail: NTIS HC A03/MF A01 CSCL 08B

Stack-unit maps show the geologic framework of an area in three dimensions, depicting not only the area distribution of geologic deposits and formations, but also their vertical distribution from the ground surface to a designated depth. The map may be presented as an outline map with each stack unit labeled within the limit of its boundary, by some simple arrangement of color and/or pattern indicating both surface and subsurface units, or by some combination of labels, colors, and patterns. The technique for preparing three-dimensional stack-unit maps is currently a method for depiciting the surficial and near-surface deposits of Illinois at the Illinois State Geological Survey. Interpretive maps for most geologic, land use, and resource evaluation can be made directly from this basic stack-unit map, given the physical and mineralogical properties for each unit and a set of criteria for each interpretative map. GRA

N82-27818# Illinois State Water Survey, Champaign.
GROUND-WATER RESOURCES OF NORTHERN VERMILION COUNTY, ILLINOIS
John P. Kempton, Robert W. Ringler, Paul C. Heigold, Keros Cartwright, and Vickie L. Poole Sep. 1981 43 p refs Sponsored in part by the Illinois Inst. of Natural Resources
(PB82-140468; IL/SGS-ENG-101) Avail: NTIS HC A03/MF A01 CSCL 08H

The thick glacial drift in the area contains two extensive sand and gravel aquifer systems: the upper system is an outwash at the base of the Glasford Formation (Illinoian); the lower is the Mahomet Sand Member of the Banner Formation (pre-Illinoian). The latter aquifer occupies the Mahomet Bedrock Valley and its tributaries. Both aquifers are extensively utilized by farms, municipalities, and industries throughout the area. Maps show different aspects of the geology of the study area, including drift thickness, bedrock surface elevation, and the thickness, areal extent, and depth of the Glasford outwash and Mahomet Sand. GRA

N82-27819# Geological Survey, Anchorage, Alaska. Water Resources Div.
WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1980 Annual Water Data Report, 1 Oct. 1979 - 30 Sep. 1980
Nov. 1981 385 p refs
(PB82-141979; USGS/WRD/HD-81/004; USGS/WRD/AK-80/1) Avail: NTIS HC A17/MF A01 CSCL 08H

Water resources data for the 1980 water year for Alaska consists of records of stage, discharge, and water quality of streams; stage and water quality of lakes; and water levels and water quality in wells and springs. This report contains discharge records for 114 gaging stations; stage only record for 1 gaging station; water quality for 55 stations; and water levels for 33 observation wells. Also included are 56 lowflow, 8 crest-stage, and 2 water-quality partial-record stations. GRA

N82-27820# Geological Survey, Jackson, Miss. Water Resources Div.
TWO-DIMENSIONAL GROUND-WATER FLOW MODEL OF THE CRETACEOUS AQUIFER SYSTEM OF LEE COUNTY AND VICINITY, MISSISSIPPI
John Michael Kernodle Dec. 1981 62 p refs Sponsored in part by Mississippi Dept. of Natural Resources
(PB82-142852; USGS/WRI-81-70; USGS/WRD/WRI-81/101) Avail: NTIS HC A04/MF A01 CSCL 08H

A two-dimensional ground-water flow model of the Eutaw-McShan and Gordo Aquifers in the area of the city of Tupelo and Lee County, Mississippi was successfully calibrated and verified using data from six long-term observation wells and two intensive studies of areal water levels. The water levels computed by the model were found to be most sensitive to changes in simulated aquifer hydraulic conductivity and to changes in head in the overlying Coffee Sand aquifer. The verified model was used to determine theoretical aquifer response to increased ground-water withdrawal to the year 2000. Two estimated rates of increase and five possible well field locations were examined. GRA

N82-27821# Geological Survey, Harrisburg, Pa. Water Resources Div.
WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1980. VOLUME 3: OHIO RIVER AND ST. LAWRENCE RIVER BASINS Annual Water Data Report, 1 Oct. 1979 - 30 Sep. 1980
Oct. 1981 313 p refs Prepared in cooperation with Pennsylvania Dept. of Environmental Resources, Harrisburg
(PB82-142688; USGS/WDR/PA-80/3; USGS/WRD-HD-80/090) Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1980 water year for Pennsylvania consist of records of discharge and water quality of streams; elevation and contents of lakes and reservoirs; and water levels of ground-water wells. Records are presented for water discharge at 82 gaging stations; elevations and contents at 22 lakes and reservoirs; water quality at 28 gaging stations; and water levels at 20 observation wells. Data for 11 crest-stage, 11 low-flow and 322 water-quality partial-record stations are included. GRA

N82-27822# JRB Associates, McLean, Va.
PEAT MINING: AN INITIAL ASSESSMENT OF WETLAND IMPACTS AND MEASURES TO MITIGATE ADVERSE EFFECTS Final Report
John M. Carpenter and George T. Farmer Jul. 1981 69 p refs Sponsored in part by EPA
(PB82-142845) Avail: NTIS HC A04/MF A01 CSCL 08I

Small-scale dry peat mining operations are having a significant environmental impact on inland bogs and fens in certain regions of the northern United States. The hydrology, water chemistry, vegetation, wildlife utilization, air quality, and nonconsumptive use values of inland bogs and fens are characterized to shed light on the ecological significance and value of these wetlands. GRA

N82-27823# Geological Survey, Honolulu, hawaii. Water Resources Div.
WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1980. VOLUME 1: HAWAII Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Reuben Lee, Santos Valenciano, Iwao Matsuoka, Johnson J. S. Yee, Salwyn S. Chinn, George Gohara, Noriaki Kojiri, Eugene S. Capellas, Rose M. Maruoka, and Akiko K. Tanaka Jul. 1981 283 p refs Sponsored in part by state of Hawaii 2 Vol.
(PB82-141334; USGS/WRD/HD-81/054; USGS/WRD/HI-80/01) Avail: NTIS HC A13/MF A01 CSCL 08H

Records of stage, discharge, and water quality of streams; and water levels and water quality in wells and springs are presented. Tables show discharge for 109 gaging stations; water quality for 10 gaging stations, 103 partial-record flow stations, and 156 wells; and water levels for 22 observation wells. Data from 109 crest-stage partial-record stations, and 19 low-flow partial-record stations are included. GRA

N82-27824# Geological Survey, Honolulu, hawaii. Water Resources Div.
WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1980. VOLUME 2: TRUST TERRITORY OF THE PACIFIC ISLANDS, GUAM, AMERICAN SAMOA, AND NORTHERN MARIANA ISLANDS Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Reuben Lee, Santos Valenciano, Iwao Matsuoka, Johnson J. S. Yee, Salwyn S. Chinn, George Gohara, Noriaki Kojiri, Eugene S. Capellas, Rose M. Maruoka, and Akiko K. Tanaka Jul. 1981 171 p refs Sponsored in part by Trust Territory of the Pacific Islands, the Governments of American Samoa, Guam, Northern Mariana Islands 2 Vol.
(PB82-141342; USGS/WRD/HD-81/055; USGS/WRD/HI-80/02) Avail: NTIS HC A08/MF A01 CSCL 08H

Water resources data for the 1980 water year presented consist of records of stage, discharge, and water quality of streams; stage of a reservoir; and water levels in wells and springs. Tables show: discharge records for 41 gaging stations; stage only record for 1 gaging station; water quality for 1 gaging station, 49 partial-record stations; water temperature for 23 gaging stations; water levels for 13 observation wells; tide level for 1 tide station; and 7 water level less tide level tables. Records from 33 low-flow partial-record stations are included. GRA

N82-27825# Clark Coll., Atlanta, Ga. Dept. of Physics.
WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1980. VOLUME 1: GREAT LAKES AND SOURIS-RED-RAINY RIVER BASINS Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Aug. 1981 244 p refs Sponsored in part by State of Minnesota 2 Vol.
(PB82-130485; USGS/WRD/HD-81/088; USGS/WRD/MN-80/1) Avail: NTIS HC A11/MF A01 CSCL 08H

Data for the 1980 water year for the Great Lakes and Souris-Red-Rainy River Basins presented cover discharge records for 54 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for

9 gaging stations, 1 stage station, 14 partial-record lake stations, and 5 wells; and water levels for 45 observation wells. Also included are 51 high-flow partial-record stations and 86 low-flow partial-record stations. GRA

N82-27826# Clark Coll., Atlanta, Ga. Dept. of Physics.
WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1980. VOLUME 2: UPPER MISSISSIPPI AND MISSOURI RIVER BASINS Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Aug. 1981 450 p refs Sponsored in part by State of Minnesota 2 Vol.
(PB82-130493; USGS/WRD/HD-81/089; USGS/WRD/MN-80/2) Avail: NTIS HC A19/MF A01 CSCL 08H

Water-resources data for the 1980 water year for Minnesota consist of records of stage, discharge, water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. Tables show discharge records for 66 gaging stations; stage and contents for 8 lakes and reservoirs; water quality for 35 stream stations, 3 partial-record stream stations, 1 partial-record lake station, and 67 wells; and water levels for 255 observation wells. Information from 112 high-flow partial record stations and 181 low-flow partial-record stations is included. GRA

N82-27827# Brown (Dayton T.), Inc., Bohemia, N. Y. Engineering and Testing Div.
ENVIRONMENTAL TEST CRITERIA FOR THE ACCEPTABILITY OF MINE INSTRUMENTATION Open File Report, 18 Jan. 1980 - 18 Jun. 1981
Kenneth Trelewicz Jun. 1981 138 p refs
(Contract DI-BM-JO-10040)
(PB82-146325; BM-OFR-1-82) Avail: NTIS HC A07/MF A01 CSCL 08I

The two-phase effort that went into developing the test criteria is described. Phase I consisted of research and mine visits to develop an environmental profile for mine instrumentation. The profile was translated into general requirements and into test requirements. A review of existing government and commercial specifications was performed to determine if they matched mine instrumentation test requirements. Finally, a set of environmental test procedures was developed to test mine instrumentation. Phase II consisted of selecting and purchasing sample mine instrumentation and subjecting them to the previously developed tests. GRA

N82-27828# Tennessee Valley Authority, Norris. Water Systems Development Branch.
GROUND WATER QUALITY MONITORING IN THE TENNESSEE VALLEY REGION
Wiley F. Harris Oct. 1981 98 p refs
(PB82-158379; TVA/ONR/WR-82/5; WR28-1-250-110) Avail: NTIS HC A05/MF A01 CSCL 08H

Geohydrology considerations for monitoring systems, monitoring system design, monitoring methods, monitor well construction, water quality data collection and system evaluation are described. These considerations can provide guidance in establishing effective monitoring systems which can detect contamination if it occurs and provide information for assessing the impacts on usable aquifers. GRA

N82-27829# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A PROGRAM FOR SINGLE-PHASE MODERATE-TEMPERATURE GEOTHERMAL WELL DRAWDOWN AND PUMPING ENERGY FOR THE HP-97 AND OTHER DESK CALCULATORS
Kwang Yu and Roy VonBriesen Nov. 1981 18 p refs
(Contracts DE-AI01-79ET-27025; EX-76-A-1008)
(PB82-148420; JHU/APL/QM-81-138) Avail: NTIS HC A02/MF A01 CSCL 08I

A desk calculator program was developed to provide a simple hydrologic model that could be used by those interested in the preliminary sizing of withdrawal rates and schedules for geothermal wells. The program was of considerable use in technical assistance projects along the Atlantic Coastal Plain. The program output is in the form of a listing that shows the incrementation years with the appropriate drawdown and the total pumping energy for each year. GRA

N82-27830# Foster-Miller Associates, Inc., Waltham, Mass.
DEMONSTRATION OF A DUST CONTROL SYSTEM FOR BOOM-TYPE ROADHEADER Open-File Report, Sep. 1979 - Jul. 1981
Mackenzie Burnett, Robert J. Pokora, and Terry Muldoon Sep. 1981 54 p refs
(Contract DI-BM-JO-199093)
(PB82-143199; BM-OFR-150-81) Avail: NTIS HC A04/MF A01 CSCL 08I

Attempts to quantify the dust problem were made by a survey of MSHA records, a survey of State nine enforcement agencies, a survey of mine records, and dust measurements taken at two mines using roadheaders. The results indicate that a serios dust problem could and may exist. The available data concerning respirable dust problems are discussed and a soluton that can potentially help to solve the problem is presented. The solution requires the use of blowing ventilation, onboard dust extraction at the source, filtration, and continued use of water sprays. T.M.

N82-27831# West Virginia Univ., Morgantown. Dept. of Electrical Engineering.
DEVELOP GROUNDING PRACTICES FOR METAL/NON-METAL MINES Open-file Report, 1 Nov. 1979 - 31 Dec. 1980
Wils L. Cooley and Herman W. Hill, Jr. 27 Nov. 1981 236 p refs
(Contract DI-BM-JO-38025)
(PB82-137308; BM-OFR-154-81) Avail: NTIS HC A11/MF A01 CSCL 08I

Electrical accident data in the metal-nonmetal mining industry were analyzed. Accidents are categorized to determine the root causes. Special attention is given to accidents associated with inadequate or defectie grounding of mine power systems. Recommendations are made concerning proper grounding practice, especially for dredges and for quarries in hard rock or sand. The costs of instituting the recommended practices were estimated for model mine power systems which are based on field data obtained from 37 mines and several electrical contractors. The expected benefits of various suggested safety practices were also estimated. GRA

N82-27832# Bureau of Mines, Reno, Nev. Research Center.
RECOVERY OF BYPRODUCT HEAVY MINERALS FROM SAND AND GRAVEL OPERATIONS IN OREGON AND WASHINGTON
G. M. Martinez, J. M. Gomes, and M. M. Wong Oct. 1981 20 p refs
(PB82-135500; BM-RI-8563; LC-81-6080) Avail: NTIS HC A02/MF A01 CSCL 08I

Methods for the recovery of byproduct heavy minerals from sand and gravel operations in Oregon and Washington were investigated. These heavy minerals are not currently recovered except for gold in a few areas. The recovery of byproduct heavy minerals would provide a domestic source of minerals presently imported, and a more efficient use of domestic resources would be accomplished. Samples from more than 40 locations were treated by gravity separation to yield heavy mineral concentrates (black sands). Magnetite, ilmenite, zircon, rutile, chromite, platinum group minerals, radioactive minerals and gold were identified in the concentrates. Individual zircon, ilmenite, chromite, magnetite, and gold products were recovered from selected concentrates by low- and high-intensity magnetic, high tension, and heavy medium separation techniques. GRA

N82-27833# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
WATER QUALITY OF THE PROPOSED NORDEN RESERVOIR, NEBRASKA, AND ITS IMPLICATIONS FOR FISHERY MANAGEMENT
James W. Yahnke May 1981 61 p refs
(PB82-149345; REC-ERC-81-8) Avail: NTIS HC A04/MF A01 CSCL 08H

Oxygen depletion in Norden Reservoir is discussed. A combination of nutrient loading models and a temperature

simulation model was used to project the trophic state, productivity, and duration of stratification of the reservoir. The tropic state index indicates that the reservoir would be eutrophic; the estimated mean annual chloropyll concentration indicated a high likelihood that algal blooms would occur. The reservoir and the river downstream are expected to support a cold-water fishery. GRA

N82-27834# Dunn Geoscience Corp., Latham, N.Y.
ANALYSIS OF POTENTIAL GEOTHERMAL RESOURCES AND THEIR USE: LEBANON SPRINGS, NEW YORK
James R. Dunn and William E. Cutcliffe Apr. 1981 59 p
(PB82-147380; NYSERDA-81-4) Avail: NTIS HC A04/MF A01 CSCL 08G

In addition to geologic mapping of the Lebanon Springs area and Williamstown, Massachusetts area, thermal gradients were measured in 25 abandoned water wells in the area. The silica content and water temperatures of 78 active domestic water wells were determined. T.M.

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-27835*# IIT Research Inst., Chicago, Ill. Technology Transfer and Market Research Section.
DOE/NASA SIMS PROTOTYPE SOLAR SYSTEM, NO. 4. PART 1: MARKET ANALYSIS. PART 2: MODULAR MANUFACTURING COST ESTIMATE
Dec. 1979 105 p refs Original document contains color photographs
(Contracts NASw-2837; NAS8-32229)
(NASA-CR-169216; NAS 1.26:169216)
Avail: NTIS HC A06/MF A01 CSCL 10B

The findings of the IIT Research Institute (IITRI) market study of the SIMS Prototype System 4, a hot water (DHW) system are documented. The feasibility of prepackaging currently available solar heating components into modular subsystems for site assembly is addressed. A documented design and installation procedure and a performance test report were prepared. The potential markets and applications for this particular system in the nonfederal market are profiled by assessing the needs and requirements of potential users and specifiers, by characterizing the nature of the market and the competitive environment, by identifying the barriers to commercial acceptance, and by estimating the size of the potential market. Author

N82-27836*# General Electric Co., Philadelphia, Pa. Energy Systems and Technology Div.
INTEGRATED RESIDENTIAL PHOTOVOLTAIC ARRAY DEVELOPMENT Quarterly Report
N. F. Shepard, Jr. 17 Feb. 1981 65 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955894-1)
(NASA-CR-169112; JPL-9950-508; DOE/JPL-955894-1; NAS 1.26:169112; QR-1) Avail: NTIS HC A04/MF A01 CSCL 10A

An optimum integrated residential photovoltaic array/module is addressed. Nineteen existing or proposed systems intended for residential applications are described. Each of these systems is rated against a comprehensive set of evaluation criteria in an effort to formulate three module design concepts for further study and analysis. This evaluation led to a number of observations which are enumerated and should be considered in future module and array designs. Three module concepts are presented as baseline design approaches to be further analyzed and optimized. These options include: (1) a rectangular, direct mounted, shingle type module; (2) an integrally mounted module with nonconductive exposed elements; and (3) an aluminum framed, stand off module. Preliminary design drawings are presented for each of these module configurations. Author

N82-27837*# Gilbert/Commonwealth, Reading, Pa.
MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MWe POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER). VOLUME 2: ENGINEERING. VOLUME 3: COSTS AND SCHEDULES Final Report
Sep. 1981 163 p Volume 3 is included as MF 5 Vol.
(Contracts DEN3-224; DE-AI01-77ET-10769)
(NASA-CR-165452-Vol-2; NASA-CR-165452-Vol-3; NAS 1.26:165452-Vol-3; NAS 1.26:165452-Vol-2; DOE/NASA/0224-1) Avail: NTIS HC E08/MF A01 CSCL 10B

Engineering design details for the principal systems, system operating modes, site facilities, and structures of an engineering test facility (ETF) of a 200 MWE power plant are presented. The ETF resembles a coal-fired steam power plant in many ways. It is analogous to a conventional plant which has had the coal combustor replaced with the MHD power train. Most of the ETF components are conventional. They can, however, be sized or configured differently or perform additional functions from those in a conventional coal power plant. The boiler not only generates steam, but also performs the functions of heating the MHD oxidant, recovering seed, and controlling emissions. S.L.

N82-27838*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARATIVE ANALYSIS OF THE CONCEPTUAL DESIGN STUDIES OF POTENTIAL EARLY COMMERCIAL MHD POWER PLANTS (CSPEC)
R. J. Sovie, J. M. Winter, A. J. Juhasz, and R. D. Berg (Gilbert Associates, Inc.) 1982 27 p refs Presented at the 20th Symp. on the Eng. Aspects of Magnetohydrodyn., Irvine, Calif., 14-16 Jun. 1982
(Contract DE-AI01-77ET-10769)
(NASA-TM-82897; DOE/NASA/10769-26; NAS 1.15:82897)
Avail: NTIS HC A03/MF A01 CSCL 10B

A conceptual design study of the MHD/steam plant that incorporates the use of oxygen enriched air preheated in a metallic heat exchanger as the combustor oxidant showed that this plant is the most attractive for early commercial applications. The variation of performance and cost was investigated as a function of plant size. The contractors' results for the overall efficiencies are in reasonable agreement considering the slight differences in their plant designs. NASA LeRC is reviewing cost and performance results for consistency with those of previous studies, including studies of conventional steam plants. LeRC in house efforts show that there are still many tradeoffs to be considered for these oxygen enriched plants and considerable variations can be made in channel length and level of oxygen enrichment with little change in overall plant efficiency. A.R.H.

N82-27839# Duracell International, Inc., Tarrytown, N.Y.
PRIMARY LITHIUM ORGANIC ELECTROLYTE BATTERY BA-5557( )/U Final Report, Jun. 1977 - Jul. 1979
N. Raman Jan. 1982 54 p
(Contract DAAB07-77-C-1805)
(AD-A110759; DELET-TR-77-1805-F) Avail: NTIS HC A04/MF A01 CSCL 10/3

The BA-5557( )/U is a lithium-sulfur dioxide type battery especially designed for constant power devices; this 30-volt battery has Li/SO2 coulombic fuel ratio of approximately 0.9, contains two (2) replaceable 8/10 amp slo-blo fuses and has a capacity of 2.5 Ah at c/4 rate at 70 degrees F. The battery case consists of a flame retardant ABS material. Author (GRA)

N82-27840# Coast Guard Research and Development Center, Groton, Conn.
ACCELERATED STRESS TESTING OF SOLAR PHOTOVOLTAIC MODULES Interim Report
S. E. Trenchard Sep. 1981 29 p refs
(AD-A107378; CGR/DC-25/81; USCG-D-59-81) Avail: NTIS HC A03/MF A01 CSCL 10/2

The history of accelerated stress testing of solar photovoltaic modules is traced. The military standard tests to which the

prototype modules were exposed and the results of that exposure are described. The evolution of the simultaneous multiple stress test to the present marine environment screening test is outlined. The results of exposure to the marine environment screening test of 136 test modules are reported. Author

N82-27841# Sandia Labs., Albuquerque, N. Mex.
GEOTHERMAL POTENTIAL ON KIRTLAND AIR FORCE BASE LANDS, BERNALILLO COUNTY, NEW MEXICO
P. R. Grant, Jr. (Energy Resources Exploration, Inc.) Oct. 1981 65 p refs
(Contract DE-AC04-76DP-00789)
(AD-A107044; SAND-81-7141) Avail: NTIS HC A04/MF A01 CSCL 08/8

Public policy expressed in a number of national directives in recent years stresses the conservation of conventional fuel supplies, a switch to alternative fuels, and the application of advanced energy technologies at federal installations. Natural gas currently furnishes 85 to 95 percent of the average 94 x 1,000,000 Btu/hr energy requirements for space heating and cooling at Kirtland Air Force Base. Studies of alternatives to the use of natural gas at the base include examination of the geothermal option. Four of North America's major physiographic provinces coalesce in central New Mexico on or near Kirtland AFB. Their junction is identified throughout much of this region by a tectonic depression occupied by the Rio Grande that is structurally complex, stratigraphically and hydrologically unique, and coincides with geologically recent volcanic centers. This trough, the Rio Grande rift, has been identified as a major geothermal resource area. The western part of Kirtland AFB is in the Albuquerque Basin segment of the Rio Grande rift. Extensive sampling and geochemical analysis of groundwater in and near the base disclosed no significant geothermal parameters. However, structural conditions and current hydrologics regimes strongly suggest that thermal waters would be masked by near surface, low temperature meteoric water originating as rain and snowfall in the nearby mountains. GRA

N82-27842# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
BATTERY SEPARATORS BASED ON POLYPHENYLQUINOXALINE POLYMER BLENDS Final Report
Isaac Angres, Len Kowalchik, and Wendy Parkhurst 1 Apr. 1981 34 p refs
(SF43431302)
(AD-A107130; NSWC/TR-81-17) Avail: NTIS HC A03/MF A01 CSCL 11/9

This document is a final report on battery separators based on polyphenylquinoxaline (PPQ) polymer blends. The report describes the preparation of the polymer blends and their extrusion into membranes, reports a series of quality assurance tests for the membranes, and reports cycle life testing of the new membranes. The test results for the PPQ blend membranes are compared with the results obtained for standard separator membranes. It is concluded that PPQ/Cellulose Acetate is a good candidate material for alkaline battery separators; however, because of cost considerations, it is not competative with similar state-of-the-art materials. Author (GRA)

N82-27843# United Technologies Research Center, East Hartford, Conn.
TECHNICAL AND ECONOMIC ASSESSMENT OF FLUIDIZED-BED-AUGMENTED COMPRESSED-AIR ENERGY-STORAGE SYSTEM: SYSTEM LOAD FOLLOWING CAPABILITY
R. D. Lessard, W. A. Blecher, and D. Merrick (Coal Processing Consultants Limited) Sep. 1981 225 p ref Prepared for Pacific Northwest Lab.
(Contract DE-AC06-76RL-01830)
(DE82-000958; PNL-3895) Avail: NTIS HC A10/MF A01

The load-following capability of fluidized bed combustion-augmented compressed air energy storage systems was evaluated. A detailed technical report describing the part-load and load following capability of both the pressurized fluid bed combustor and the entire pressurized fluid bed combustor/-compressed air energy storage systems is presented. The conclusions are encouraging and indicate that the open-bed PFBC/CAES power plant should provide good part-load and transient performance, and should have no major equipment-related constraints, specifically, no major problems associated with the performance or design of either the open-end PFBC or the PFBC/CAES power plant in steady-state, part-load operation are envisioned. The open-bed PFBC/CAES power plant would have a load following capability which would be responsive to electric utility requirements for a peak-load power plant. DOE

N82-27844# United Technologies Research Center, East Hartford, Conn.
TECHNICAL AND ECONOMIC ASSESSMENT OF FLUIDIZED-BED-AUGMENTED COMPRESSED AIR ENERGY. STORAGE SYSTEM. VOLUME 2: INTRODUCTION AND TECHNOLOGY ASSESSMENT
A. J. Giramonti, R. D. Lessard, D. Merrick (Coal Processing Consultants Limited), and M. J. Hobson (Acres American Inc.) Sep. 1981 230 p refs Prepared for Pacific Northwest Lab.
(Contract DE-AC06-77RL-01830)
(DE82-000938; PNL-3686-Vol-2) Avail: NTIS HC A11/MF A01

The results are described of a study subcontracted by PNL to the United Technologies Research Center on the engineering feasibility and economics of a CAES concept which uses a coal fired, fluidized bed combustor (FBC) to heat the air being returned from storage during the power production cycle. By burning coal instead of fuel oil, the CAES/FBC concept can completely eliminate the dependence of compressed air energy storage on petroleum fuels. A discussion of program background and an in-depth coverage of both fluid bed combustion and turbomachinery technology pertinent to their application in a CAES power plant system is presented. The CAES/FBC concept appears technically feasible and economically competitive with conventional CAES. However, significant advancement is required in FBC technology before serious commercial commitment to CAES/FBC can be realized. DOE

N82-27845# Bevilacqua (O. M.) and Associates, Oakland, Calif.
PRELIMINARY SAFETY ANALYSIS OF THE ZINC CHLORINE ELECTRIC VEHICLE BATTERY
Mar. 1981 73 p refs Prepared for Argonne National Lab.
(Contracts W-31-109-eng-38)
(DE82-001873; ANL/CNSV-TM-84) Avail: NTIS HC A04/MF A01

Since the design is not yet fixed or fully detailed, the intent is to identify the principal areas of uncertainty and concern for public safety, thereby aiding in further development and initial deployment planning. Of the wide range of potential hazards considered, all were discounted except for possible release of toxic chlorine gas under conditions such as a major collision. The risk of casualties in such accidents appears to be significant, but probably similar to that for casualty rates now arising from sources unique to the ICE vehicle such as carbon monoxide poisoning and fire. DOE

N82-27846# Thermo Electron Corp., Waltham, Mass.
ADVANCED THERMIONIC TECHNOLOGY PROGRAM Progress Report, Apr. - Jun. 1981
1981 32 p ref
(Contract DE-AC02-76ET-11292)
(DE82-002116; TE-4258-25-82; PR-47; COO-3056-47) Avail: NTIS HC A03/MF A01

Improvement of thermionic performance to the level that thermionic topping of fossil fuel powerplants becomes technically possible and economically attractive was investigated. The operation of a thermionic module in a power plant during the mid 1980's and to demonstrate reliable thermionic operation in a combustion environment were studied. Reported accomplishments include: (1) continuing stable output from the combustion test of the one inch diameter hemispherical silicon carbide diode (Converter No. 239) at an emitter temperature of 1730 K for a period of over 8500 hours; (2) determination of the elemental composition (i.e., molybdenum, nickel and cesium) through the sublimed molybdenum collector of Converter No. 262; and (3) demonstration of tungsten CVD onto molybdenum flange using a reuseable graphite mandrel. DOE

N82-27847# Insights West, Inc., Los Angeles, Calif.
FUEL FROM THE SUN: SOLAR COMMERCIAL AND

INDUSTRIAL APPLICATIONS FOR THE 1980'S
Sep. 1981 51 p refs
(Contract DE-AC02-79CS-30159)
(DE82-003285; WSUN-74) Avail: NTIS HC A04/MF A01

The use of solar energy for industrial and commercial applications, particularly process heat, is presented. Flat plate, evacuated tube, and parabolic trough solar collectors are described briefly, and their temperature ranges and costs are given. Other solar technologies, including biomass conversion, wind power, solar ponds, photovoltaics and passive design are also discussed. A checklist is given to help determine the feasibility of a solar heating system for a particular application. Economic aspects of using a solar energy system are discussed. Information is given on the installation and operation of a solar energy system, including the question of solar access. DOE

N82-27848# Case Western Reserve Univ., Cleveland, Ohio.
OXYGEN ELECTRODES FOR ENERGY CONVERSION AND STORAGE Annual Report, 1 Oct. 1979 - 30 Sep. 1980
5 Nov. 1981 284 p refs
(Contract DE-AC02-77ET-25502)
(DE82-005305; DOE/ET-25502/3) Avail: NTIS HC A13/MF A01

The main theme of this project has been to develop high performance oxygen electrodes for a spectrum of applications including industrial electrolysis, metal-air batteries and fuel cells. The research at CWRU emphasizes the development of more effective electrocatalysts for both O2 reduction and electrogeneration and also more effective electrode structures (particularly for O2 cathodes) for utilizing these catalysts. The approach used by the CWRU group involves the development of a predictive base to guide the search for the new catalysts systems. The DSC group is concerned principally with the evaluations of catalysts developed and recommended by CWRU as well as by their own staff and the fabrication of electrode structures for these evaluations. Progress is reported in detail. DOE

N82-27849# Delegationen foer Energiforskning, Stockholm (Sweden).
LONG-TERM ENERGY OPTIONS FOR SWEDEN. THE IEA MODEL AND SOME SIMULATION RESULTS
P. A. Bergendahl and C. Bergstroem 1981 261 p refs
(DE82-900916; DFE-36) Avail: NTIS (US Sales Only) HC A12/MF A01; DOE Depository Libraries

Major findings of the simulations made using the Swedish version of the MARKAL model are summarized. It is an attempt to determine what new energy supply, conversion and end-use technologies will be needed in Sweden during the next several decades, and to assess the energy contribution that can be expected from them. The reader is aquainted with the analytical approach to the planning and analysis of energy research and development programs used. An overview is given of the problem structure and analytical apparatus. DOE

N82-27850# Kusko (Alexander), Inc., Needham Heights, Mass.
POWER SUPPLY SUBSYSTEM FOR MHD GENERATOR SUPERCONDUCTING MAGNET, BASELINE POWER SUPPLY DESIGNS AND COSTS
A. Kusko and S. M. Peeran 10 Apr. 1981 154 p refs
(Contract DE-AT01-76ET-10813)
(DE81-024285; DOE/ET-10813/T1) Avail: NTIS HC A08/MF A01

An analysis of the dc power supply requirements for superconducting magnets used in MHD generators of ratings 250 MW sub e to 1000 MW sub e is presented. The power supplies considered are rated for a peak power of 10 MW and for currents of 20 kA to 100 kA. The various aspects discussed include: rectifier configurations and specifications, control requirements, dumping the magnet energy, and rectifier size, arrangement and cost. DOE

N82-27851# Air Products and Chemicals, Inc., Allentown, Pa.
DEMONSTRATION OF A NITROGEN-BASED CARBURIZING ATMOSPHERE Final Report
R. J. Peartree Sep. 1981 140 p refs
(Contract DE-AC07-78CS-40234)
(DE82-004196; DOE/CS-40234/T2) Avail: NTIS HC A07/MF A01

A comprehensive energy study comparing nitrogen-based atmospheres to endothermic atmospheres was completed. Energy savings of up to 18.8% combined with production increases averaging 10% are possible with nitrogen-methanol carburizing atmospheres. Although the economics will vary depending on application and location, these energy savings and production increases are available to the heat treater at costs comparable to traditional endothermic atmosphere. The nitrogen-methanol atmosphere systems are controllable using all of the currently available methods of carbon control. DOE

N82-27852# California Univ., Livermore. Lawrence Livermore Lab.
PHOTOVOLTAICS: CURRENT STATUS AND FUTURE PROJECTIONS
D. W. Dorn 19 Oct. 1981 14 p refs
(Contract W-7405-eng-48)
(DE82-002684; UCID-19222) Avail: NTIS HC A02/MF A01

The generation of electricity by photovoltaic means was examined. Projections of near future developments are made, together with estimates of their impact on the cost and availability of photovoltaic systems for various markets. This concluded that photovoltaic systems should be able to deliver electricity at a cost of between 5 to 10 cents per kilowatt hour by 1986. DOE

N82-27853# VSE Corp., Alexandria, Va.
OTEC SUPPORT SERVICES Quarterly Technical Progress Report, 15 Aug. - 14 Nov. 1981
Nov. 1981 15 p
(Contract DE-AC02-78ET-21002)
(DE82-005470; DOE/ET-21002/T20; QTPR-14) Avail: NTIS HC A02/MF A01

Progress in system integration, system engineering, and management services is reported. The effort is divided into seven tasks: survey, analysis, and evaluation of technical program status; program technical monitoring; development and implementation of methodology for identification, evaluation, and tradeoff for major subsystem configurations; technical assessments; OTEC system integration; environment and siting considerations; and transmission subsystem considerations. DOE

N82-27854# Satzler (Ron), Princeville, Ill.
LOW COST, MULTIPURPOSE SOLAR ENERGY SYSTEM
R. Satzler 5 Aug. 1981 22 p
(Contract DE-FG02-79R5-10108)
(DE81-030955; DOE/R5-10108/2) Avail: NTIS HC A02/MF A01

A solar heating system is described using 3500 ft(2) of solar air heater collectors and 85 tons of rock storage. The system is designed for farm use and the following five purposes are discussed: grain drying, house heating, house cooling, domestic water heating, and workshop heating. DOE

N82-27855# Architects Taos, N. Mex.
PASSIVE SOLAR HEATING SYSTEM Final Technical Report
W. Mingenbach 28 Aug. 1981 139 p refs
(Contracts DE-FC03-77CS-31513; EG-77-A-03-1513)
(DE82-003269; DOE/CS-31513/T1) Avail: NTIS HC A07/MF A01

The Toas State Office Building is a single-story office building in New Mexico which incorporates passive collection and storage of solar energy along with natural lighting for general illumination. The building is oriented to take advantage of early morning sunlight and is designed to supply 70% of the heating load by solar heat. The site is equipped with clerestory windows, totaling 2695 square feet, 296 square feet of south facing windows, and east and west window scoops totaling 218 square feet. The collected solar energy is stored in 14,080 gallons of water contained in drums located in the clerestory area, as well as in the masonry construction mass. Auxiliary heat is provided via electric strips in the supply ducts. Movable, insulated shutters are provided to reduce the loss from the clerestory window area at night. The project is described with pictures and diagrams of the final installation provided. An updated performance data report is included, and functional problems, general comments, maintenance and refurbishment recommendations are discussed. DOE

N82-27856# Fraunhofer-Inst. fuer Systemtechnik und Innovationsforschung, Karlsruhe (West Germany).
POSSIBILITIES FOR ENERGY CONSUMPTION THROUGH MICROELECTRONICS Final Report
Gerd Angerer, Ewald Boehm, Ursula Hauser, Eberhard Jochen, Wilhelm Mannsbart, Thomas Mentzel, Roland Diehl (Fraunhofer-Inst. fuer Angewandte Festkoerperphysik), Michael Konstanzer (Fraunhofer-Inst. fuer Angewandte Festkoerperphysik), Adolf Goetzberger (Fraunhofer-Inst. fuer Bauphysik), Dirk Oswald (Fraunhofer-Inst. fuer Bauphysik) et al Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 540 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-0022; ISSN-0340-7608) Avail: NTIS HC A23/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 70,50

Application of microelectronic sensors, integrated circuits, and actuators in order to control energy consuming processes and reduce energy losses was studied. The energy saving potential of microelectronics was investigated in various sectors of secondary energy consumption, i.e., heating, electrical household equipment, road traffic, business, hot water and steam generation, and use of electrical motors. Findings are based on secondary energy consumption in the Federal Republic of Germany. Results show that potential energy savings can reduce demand for primary energy by 265 to 290 billion kilowatt hours. (8% to 9% of the total demand of the Federal Republic of Germany). Author (ESA)

N82-27857# Bayerisches Landesamt fuer Wasserwirtschaft (West Germany).
INVESTIGATION INTO THE ECONOMY OF METHANE GAS UTILIZATION IN SEWAGE TREATMENT PLANTS Final Report
Peter Wolf Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 154 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-025; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32

The economic feasibility of methane gas utilization in small and medium sized sewage treatment plants was studied. Assuming that rising energy costs make this energy source attractive, existing and theoretical model plants of various sizes were investigated by considering different price scales for electric power and fuel oil. This was done with variation of the kind of biological sewage treatment, sludge treatment, and of kinds and facilities of methane gas utilization. Results show that using methane gas for power generation is relatively economic in comparison to alternative methods of gas utilization for treatment plants bigger than 50,000 population equivalent. Author (ESA)

N82-27858# National Academy of Sciences - National Research Council, Washington, D. C.
ELECTRIC POWER FROM ORBIT: A CRITIQUE OF A SATELLITE POWER SYSTEM
Raphael Kasper 1981 350 p refs
(Grant NSF PRM-79-19687)
(PB82-133083; NSF/PRM-81004) Avail: NTIS HC A15/MF A01 CSCL 10B

As a basis for assessing feasibility and projecting costs, this study focuses on the elements of a reference system which includes conceptual designs of various space vehicles and construction bases. The system uses photovoltaic devices for energy conversion in space and microwave devices for energy transmission to Earth. In addition to the major conclusions of the study, a number of detailed findings and recommendations are presented. These cover important technological aspects of a satellite power system--economic analyses; environmental concerns; sociopolitical aspects of development; and a comparison of a satellite power system with potentially competing technologies that have prospects for meeting very long-term needs for electricity. GRA

N82-27859# Pacific Northwest River Basins Commission, Vancouver, Wash.
WATER AND EMERGING ENERGY TECHNOLOGIES: SUMMARY REPORT
Mar. 1981 106 p Sponsored in part by Water Resources Council, Washington, D.C.
(PB82-153123) Avail: NTIS HC A06/MF A01 CSCL 13B

An assessment of possible energy development in structural basins of the Pacific Northwest is presented. The energy technologies examined include small hydro, geothermal electric, geothermal heat, biomass/cogeneration, and coal gasification. T.M.

N82-27860# Pacific Northwest River Basins Commission, Vancouver, Wash.
WATER AND EMERGING ENERGY TECHNOLOGIES
Mar. 1981 139 p Sponsored in part by Water Resources Council, Washington, D.C.
(PB82-153131) Avail: NTIS HC A07/MF A01 CSCL 13B

In 1977, the Department of Energy requested that the Water Resources Council undertake the required assessments whereupon development of Section 13(a) assessments were begun in the Missouri River, Ohio River, and upper Colorado River Basins. In September 1979, a Memorandum of Agreement between the Water Resources Council and Pacific Northwest River Basins Commission initiated an assessment in the Pacific Northwest. This report documents the findings and conclusions of that 13(a) assessment are presented. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-27861# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
INTERIM NOISE ASSESSMENT GUIDELINES
William J. Galloway and Theodore J. Schultz HUD Oct. 1979 53 p refs Revised
(Contract HUD-H-2243R)
(BBN-4003R) Avail: NTIS HC A04/MF A01

Environmental noise pollution assessment guidelines are presented. Worksheets for aircraft, roadways, railways, and a walk away test are presented. N.W.

N82-27862# National Inst. for Water Research, Pretoria (South Africa).
NIWR INTERLABORATORY COMPARISON STUDY NO. 80/C: DETERMINATION OF TRACE METALS IN SEWAGE SLUDGE. EVALUATION RESULTS
R. Smith 1981 38 p refs
(CSIR-RR-395; ISBN-0-7988-2138-8) Avail: NTIS HC A03/MF A01

Trace metals, namely aluminum, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc are analyzed from two samples of dried sewage sludge. The results are evaluated and discussed, along with some of the advantages and disadvantages of various sample pretreatment techniques. S.L.

N82-27863# Ministry of the Environment, Ottawa (Ontario). Pollution Control Branch.
REPORT ON 1980 INTERNATIONAL MEETING OF NOISE REGULATORY OFFICIALS ON ALIGNMENT OF NOISE TEST PROCEDURES, WASHINGTON, D.C., MAY 1980
J. Manuel 1981 16 p refs Presented at Intern. Symp. on Transport Noise, Pretoria, 21-23 Oct. 1981
(S-258) Avail: NTIS HC A02/MF A01

Regulations and policies of several countries were reviewed. Emphasis is placed on the labeling of construction equipment and domestic appliances. Noise limits on motorized vehicles are discussed. T.M.

N82-27864# Ministry of the Environment, Ottawa (Ontario). Pollution Control Branch.
TRANSPORTATION NOISE, ITS IMPACT, PLANNING AND REGULATION
J. Manuel 1981 19 p refs Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981
(S-258) Avail: NTIS HC A02/MF A01

Examples of the effects transportation noise has on communi-

ties are provided. Recent work in noise pollution in Canada is highlighted. National policies were examined and regulations were reviewed. T.M.

N82-27865# Airbus Industrie, Blagnac (France). Acoustics Dept. of Aerospatiale.

AIRBUS INDUSTRIE AND COMMUNITY NOISE

J. Chausonnet 1981 35 p Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981

Avail: NTIS HC A03/MF A01

The contributions of the total noise perceived outside an aircraft during takeoff and landing by the engine and the aerodynamics of the aircraft are considered. The reduction of engine noise by design, the location of the engine and acoustic treatment of the nacelles is discussed. Aerodynamic noise reduction is considered in terms of aircraft design, operational procedures, and aircraft weight. A noise measuring facility used for checking operational procedures and measuring noise levels is described. Author

N82-27866# Goodyear International Tire Technical Center (Luxembourg). Tire Design Research Dept.

TIRE/ROAD NOISE

G. J. Kind 1981 20 p Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981

Avail: NTIS HC A02/MF A01

The different mechanisms that are at the origin of tire to surface noise are discussed. Various tire noise measurement and analysis techniques are described and analysed regarding their correlation to subjective testing. Means to reduce tire noise are proposed and discussed in the context of other important tire properties. Author

N82-27867*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CALCULATION OF COMPOSITION DISTRIBUTION OF ULTRAFINE ION-H2O-H2SO4 CLUSTERS USING A MODIFIED BINARY ION NUCLEATION THEORY

Jag J. Singh, Alphonso S. Smith, Lo Y. Chan (Institute for Atmospheric Optics and Remote Sensing), and Glenn K. Yue (Institute for Atmospheric Optics and Remote Sensing) Jun. 1982 24 p refs

(NASA-TP-2031; L-1533; NAS 1.60:2031) Avail: NTIS HC A02/MF A01 CSCL 13B

Thomson's ion nucleation theory was modified to include the effects of curvature dependence of the microscopic surface tension of field dependent, nonlinear, dielectric properties of the liquid; and of sulfuric acid hydrate formation in binary mixtures of water and sulfuric acid vapors. The modified theory leads to a broadening of the ion cluster spectrum, and shifts it towards larger numbers of H2O and H2SO4 molecules. Whether there is more shifting towards larger numbers of H2O or H2SO4 molecules depends on the relative humidity and relative acidity of the mixture. Usually, a broadening of the spectrum is accompanied by a lowering of the mean cluster intensity. For fixed values of relative humidity and relative acidity, a similar broadening pattern is observed when the temperature is lowered. These features of the modified theory illustrate that a trace of sulfuric acid can facilitate the formation of ultrafine, stable, prenucleation ion clusters as well as the growth of the prenucleation ion clusters towards the critical saddle point conditions, even with low values of relative humidity and relative acidity. T.M.

N82-27868# Engineering-Science, Inc., McLean, Va.

AIR POLLUTION TESTING OF HYPERGOLIC FUEL VAPOR SCRUBBERS AT CAPE CANAVERAL AIR FORCE STATION, FLORIDA Final Report, Jul. - Nov. 1980

W. Keith Felts Tyndall AFB, Fla. Air Force Engineering and Service Center. Oct. 1981 52 p

(Contract F33615-80-D-4001; AF Proj. 1900)

(AD-A110635; AFESC/ESL-TR-80-58; REPT-3729.00/30) Avail: NTIS HC A04/MF A01 CSCL 13/2

Hypergolic fuel and oxidizer scrubbers were studied to determine emissions produced during actual hypergol transfers. Scrubber liquor used in the fuel scrubber was 14 percent citric acid and the scrubber liquor in the oxidizer scrubber was 5 percent NaOH - 12 percent Na2SO3. Author (GRA)

N82-27869# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

CONTROL OF AIR POLLUTION FROM AVIATION: THE EMISSION STANDARD SETTING PROCESS Ph.D. Thesis

Dennis Freeman Naugle 1981 260 p refs

(AD-A107435; AFIT-CI-81-26D) Avail: NTIS HC A12/MF A01 CSCL 01/2

The potential effects of aviation on ambient air quality with special emphasis on the requirement and techniques for setting aviation control standards are discussed. A logical framework called the 'hypothesis decision model' was developed. It offers a structured way of dealing with complex issues. Application of the model focuses on aircraft sources but a generic version is also proposed. Adoption would explicitly document the manner that technical evidence is considered in a variety of decisions concerning the establishment of emission standards. Author

N82-27870# General Accounting Office, Washington, D. C. Energy and Minerals Div.

THE DEBATE OVER ACID PRECIPITATION: OPPOSING VIEWS, STATUS OF RESEARCH

11 Sep. 1981 54 p refs

(AD-A106925; GAO/EMD-81-131) Avail: NTIS HC A04/MF A01 CSCL 04/2

The use of coal as a substitute for imported oil is raising concern over the possible impact of acid precipitation on the environment and human health. Precipitation can become acidified when sulfur and nitrogen oxides emitted by fossil-fueled powerplants, vehicles, and other man-made or natural sources are chemically changed in the atmosphere and return to Earth as acid compounds. Environmental organizations and some agencies and interest groups contend that more stringent emission controls are needed immediately. On the other hand, some agencies and many industries, particularly in the coal and utility sectors, argue that much more research is needed to determine if achievable emissions reductions could significantly diminish the extent of acid precipitation, and if the benefits of such regulations would be worth their potentially high cost. GRA

N82-27871# Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.

AN IN-STACK DIFFUSION CLASSIFIER FOR AEROSOL MASS DISTRIBUTION MEASUREMENT Final Report, Jun. 1978 - Jun. 1980

Dale A. Lundgren and Cumbum N. Rangaraj Tyndall AFB, Fla. AFESC Apr. 1981 36 p refs

(Contract EPA-R-805762-010; AF Proj. 2103)

(AD-A113771; AFESC/ESL-TR-81-04) Avail: NTIS HC A03/MF A01 CSCL 14/2

A five-stage, screen-type diffusion classifier was designed and built to make in-situ measurement of submicron aerosols at temperatures and pressures encountered in industrial-type exhaust stacks. Laboratory calibration proceeded satisfactorily and held strong promise of successful field demonstration. However, major problems were encountered in test procedures during both field tests (at the Jacksonville Florida Electric Authority (J.E.A.)) Southside generating Station, Unit 4 (oil-fired boiler) and the Naval Air Rework Facility, Jacksonville, Jet Engine test Cell 11 (J-52 engines). Conditioning of the glass fiber filters to sulfur oxides was not done at the Southside Power Plant - this appears to have been the major problem there. Temperatures of the exhaust stack exceeded 200 C at the Jet Engine Test Cell - consequent weight loss due to grease vaporization appears to have been the problem there. Author (GRA)

N82-27872# National Inst. for Transport and Road Research, Pretoria (South Africa).

TRAFFIC NOISE GENERATION OF ASPHALT ROAD SURFACES

A. T. Visser and R. N. Walker 1981 14 p refs Presented at the Intern. Symp. on Transportation Noise, Pretoria, 21-23 Oct. 1981

Avail: NTIS HC A02/MF A01

The noise generating properties of different asphalt road surfacing types are considered. Noise levels at low and high speeds were investigated. Author

N82-27873# California Univ., Livermore. Lawrence Livermore Lab.

PERTURBATION METHOD FOR THE APPROXIMATION OF SINGLE FIBER INERTIAL EFFICIENCY

Dallas O. Banks and G. J. Kurowski Oct. 1981 43 p refs
(Contract W-7405-eng-48)
(DE82-003183; UCRL-15401) Avail: NTIS HC A03/MF A01

One of the important problems in the theoretical study of fibrous air filters is the determination of the fiber collection efficiency for submicron particles where particle inertia is significant. Because this efficiency can not, in general, be given by a closed formula, numerical methods are required. One approach is to use the dynamic equations of particle motion and the method of shooting. However, this requires considerable computing time when extensive parameter studies are carried out. A perturbation method is developed for the numerical approximation of the inertial efficiency. Example cases are given which show that for particles of radius one micron or less the observed error is approximately 7% or less as compared to that given by a shooting method. Furthermore, the average computation time is approximately one-twentieth of that required for the shooting method. DOE

N82-27874# California Univ., Livermore. Lawrence Livermore Lab.

THREE-DIMENSIONAL, CONSERVATION EQUATION MODEL FOR SIMULATING LNG VAPOR DISPERSION IN THE ATMOSPHERE

Stevens T. Chan, Philip M. Gresho, and Donald L. Ermak Sep. 1981 18 p refs
(Contract W-7405-eng-48)
(DE82-001053; UCID-19210) Avail: NTIS HC A02/MF A01

A numerical model for simulating the vapor spread and dispersion associated with LNG releases in the atmosphere is described. The model is based on solving the set of three dimensional, time dependent, conservation equations governing incompressible flows. Spatial discretization is performed via a modified Galerkin finite element method (GFEM), and time integration is carried out via the forward Euler method (pressure is computed implicitly, however). Cost effective techniques including subcycling, mass lumping, and reduced Gauss-Legendre quadrature are discussed. Numerical results obtained by using this model are presented. DOE

N82-27875# California Univ., Livermore. Lawrence Livermore Lab.

SCREENING METHODOLOGY FOR ASSESSING THE POTENTIAL IMPACT OF SURFACE RELEASES OF CHLORINATED HALOCARBONS ON STRATOSPHERIC OZONE

D. J. Wuebbles and P. S. Cornell Nov. 1981 42 p refs
(Contract W-7405-eng-48)
(DE82-002678; UCID-19233) Avail: NTIS HC A03/MF A01

A screening methodology to determine the potential effect on stratospheric ozone that is expected from surface chemical releases was developed. The principles of the methodology are general and the estimation processes are applied to gaseous and volatile liquid or solid alkyl, alkemyl and aryl chloroarbons. These compounds, in particular the alkyl chlorocarbons, are most likely to reach the stratosphere in significant amounts, and when dissociated there to produce Cl atoms, most likely to affect the ozone concentration. The methodology is applicable to bromine containing species. DOE

N82-27876# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

A PRELIMINARY ESTIMATION OF THE EXPECTED NOISE LEVELS FROM THE SWEDISH WIND ENERGY CONVERSION SYSTEM (WECS) PROTOTYPES MAGLARP AND NAESUDDEN

Stig Soedeqvist 13 Apr. 1982 36 p refs
(Contract NE-5062-101)
(FFA-TN-1982-01) Avail: NTIS HC A03/MF A01

Noise levels for horizontal axis turbines whose diameter = 75 m and electric power output = 2 to 3 MW were predicted. Noise criteria in view of Swedish regulations and the effects of wind dependent background noise are considered. Highest sound pressure levels are recorded downwind, due to source directionality. Wind also introduces downward refraction and extra damping due to prolonged propagation path. Unexpectedly large low frequency noise values can exist where blade passage frequency and natural vortex separation frequency are similar. Problems with unpleasant low frequency noise could be overcome by setting sound level maxima of 40 dBA or 55 dBC in urban areas, 35 dBA or 55 dBC in recreation areas, and by lowering these limits by 5 dB for impulse and tonal noise. Rise in background noise level caused by increased wind speed should be accounted for when setting limits. Author (ESA)

N82-27877# Environmental Protection Agency, Kansas City, Mo.

PROPOSED WASTEWATER TREATMENT FACILITIES LOWER MISSOURI RIVER BASIN, ST. LOUIS, MISSOURI

Sep. 1981 138 p refs
(PB82-142837; EPA-907/9-81-007) Avail: NTIS HC A07/MF A01 CSCL 13B

Environmental effects of alternatives to abate wastewater pollution in the Lower Missouri River Basin's three watersheds (Creve Coeur, Fee Fee, and Lower Bonhomme, in St. Louis County) were evaluated. Both the regional and subregional alternatives would result in long-term water quality improvement, and would have minor impact on the growth pattern of this approximately 80%-developed study area. GRA

N82-27878# Virginia Highway and Transportation Research Council, Charlottesville.

EFFECTIVENESS OF PREDICTIVE COMPUTER PROGRAMS IN THE DESIGN OF NOISE BARRIERS. A BEFORE AND AFTER APPROACH, PART 2-A Final Report, Jun. 1975 - Jun. 1981

J. K. Haviland and D. F. Noble Jun. 1981 59 p refs 3 Vol.
(PB82-139536; VHTRC-81-R54-PT-2A; FHWA/VA-81/55) Avail: NTIS HC A04/MF A01 CSCL 13B

To evaluate the efficacy of the predictive computer programs used to design the barriers, noise measurements were taken before and after construction of an Earth berm and plywood wall alongside I-495 in Northern Virginia. The effect of the barrier was taken as the difference between the before and after dropoffs in noise levels from the roadside to the location under study. The measured effects were compared to the predicted effects. Less than half of the measured effects were within 3 dB of the predicted values. However, when the effects of the time of day and human activity within the neighborhood were taken into account, 65% of the noise values obtained during periods of low human activity were within 3 dB of the predicted values. Author

N82-27879# Virginia Highway and Transportation Research Council, Charlottesville.

EFFECTIVENESS OF PREDICTIVE COMPUTER PROGRAMS IN THE DESIGN OF NOISE BARRIERS. A BEFORE AND AFTER APPROACH. PART 2-B: SUPPLEMENT. THE NOISE LEVEL DATA Final Report, Jun. 1975 - Jun. 1981

J. K. Haviland and D. F. Noble Jun. 1981 103 p refs 3 Vol.
(PB82-139544; VHTRC-81-R54-Pt-2B; FHWA/VA-82/54-Pt-2B) Avail: NTIS HC A06/MF A01 CSCL 13B

To evaluate the efficacy of the predictive computer programs used to design the barriers, noise measurements were taken before and after construction of an Earth berm and plywood wall alongside I-495 in Northern Virginia. Despite intrusive noise periodically overriding the traffic noise from I-495, the latter clearly dominated the neighborhood noise environment. Direct correlations made between variations in L10 levels and truck traffic and between L50 and L90 levels and automobile traffic seem to support the generalization that the L10 levels are controlled by trucks and the L90 levels are controlled by automobiles. See Part II-A for a description of the study and the discussion of the results. Author

N82-27880# Economics, Statistics and Cooperatives Service, Washington, D. C. Natural Resource Economics Div.

MEASURING IMPACTS OF RESOURCE MANAGEMENT ON LAND QUALITY: A STRUCTURE FOR ANALYSIS

Eric B. Oswald May 1981 28 p refs
(PB82-152828; AGESS-810508) Avail: NTIS

HC A03/MF A01 CSCL 13B

Existing methods were reviewed and a new structure model is proposed for defining and measuring land quality and for assessing the impacts on land quality of resource development plans and actions. The new model subdivides land quality into two major components: (1) land as a productive and useful resource; and (2) land as a scenic or aesthetic resource. Means to measure these two components and merge them into a land quality index are presented. GRA

N82-27881# Jones and Stokes Associates, Inc., Sacramento, Calif.

SPOKANE COUNTY COMPREHENSIVE WASTEWATER MANAGEMENT PLAN Final Environmental Impact Statement.

Kathryn M. Davidson Aug. 1981 323 p refs Sponsored by EPA

(PB82-151564; EPA-910/9-81-087) Avail: NTIS HC A14/MF A01 CSCL 13B

The environmental impact statement states the Environmental Protection Agency's recommended alternative for wastewater treatment. The alternative chosen by the county and approved by the EPA includes collection and transport of all county wastewater to the city of Spokane's central wastewater treatment plant. GRA

N82-27882# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.

FIELD MEASUREMENTS IN SUPPORT OF DISPERSION MODELING IN COMPLEX TERRAIN (1980) Annual Report

Wynn Eberhard Jul. 1981 26 p refs

(PB82-148644; NOAA-81102005) Avail: NTIS HC A03/MF A01 CSCL 13B

The EPA is engaged in a concerted effort to develop models for prediction of air quality in complex terrain. Remote sensors and an instrumented aircraft from the Wave Propagation Laboratory and other elements of NOAA's Environmental Research Laboratory are participating with EPA in a series of field experiments that are necessary for development and validation of such models. A calibrated particulate mapping lidar with multiwavelength capability is the principal remote sensor. NOAA's accomplishments during the first year (February 1980 - January 1981) under the EPA-NOAA Interagency Agreement for Energy and Environment are participation by lidar and other sensors in EPA's Small Hill Impaction Study No. 1 studying plume impingement on elevated terrain; preliminary experiment by instrumented aircraft on power plant plumes near Farmington, New Mexico; lidar participation in DOE's 1980 ASCOT experiment investigating nocturnal drainage flows in mountainous terrain; and improvements to the lidar for plume mapping applications. GRA

N82-27883# JRB Associates, McLean, Va.

ANALYSIS OF WASTEWATER DISCHARGE FROM MARINE SANITATION DEVICES Final Report

Apr. 1981 181 p refs

(Contract EPA-68-01-6347)

(PB82-158072; EPA-440/2-81-013) Avail: NTIS HC A09/MF A01 CSCL 13B

Data pertinent to analyzing alternative Federal policies for regulating the discharge of human wastes from recreational watercraft is presented. The study indicates that low compliance with the current marine sanitation device (MSD) regulations is the result of deliberate resistance, uncertainty about the finality of the current regulations, and doubt that the regulations will be effectively enforced. The report indicates that pleasure boats, particularly when congregated in relatively slow-moving waters, such as marina basins or inlets with minimal current or tidal action, can produce unacceptable fecal coliform concentrations. Of the two major disinfectant chemicals commonly used in MSD's (chlorine & formaldehyde), only chlorine was shown to be toxic in the aquatic environment, but only in discharges from large shore-based facilities, such as sewage treatment plants. GRA

N82-27884# Conference of Radiation Control Program Directors, Inc., Rockville, Md.

NATURAL RADIOACTIVITY CONTAMINATION PROBLEMS Final Report

Sep. 1981 134 p refs Prepared in cooperation with Nuclear Regulatory Commission

(Contracts PHS-223-79-6010; EPA-IAG-D7-0968)

(PB82-140443; NCRCPD-1; FR-2) Avail: NTIS HC A07/MF A01 CSCL 18H

Levels of naturally occurring radionuclides associated with the bauxite, columbium-tantalum, phosphate, tin, pumice, and titanium mineral extraction industries are reported. Data are also presented on radioactivity measurements in ground water, in selected geothermal waters, and in oil production brines. Radiation protection guidance is provided for uranium recovery from wet-process phosphate plants, for soil contamination limits, and for radiological exposure in natural caves. Dose pathways from incidental uses of naturally occurring radioactive materials are presented. Model state regulations for protecting public health and safety from use and disposal of naturally occurring radioactive material are outlined. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-27885# IRT Corp., San Diego, Calif.

INVERSE SCATTERING FOR ELECTRON DENSITY PROFILE DETERMINATION, VOLUME 1 Final Report, 28 Aug. 1980 - 30 Oct. 1981

W. Ross Stone Hanscom AFB, Mass. AFGL 24 Sep. 1981 77 p refs

(Contract F19628-80-C-0187; AF Proj. 2310)

(AD-A111826; IRT-8205-003-Vol-1; AFGL-TR-81-0282-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 04/1

The application of Exact Inverse Scattering Theory to the determination of the spatial distribution of ionospheric electron density is investigated. Vector field measurements and the effects of the Earth's magnetic field are included. The uniqueness of the solution is proven for these cases. An exact analytic, closed-form solution for the source term in the inverse scattering problem is obtained. Practical and numerical aspects of using the techniques developed are examined. Author (GRA)

N82-27886# Oklahoma State Univ., Stillwater. Electronics Lab.

DEVELOPMENT OF INSTRUMENTATION FOR RESEARCH PROBES Final Report, 1 Feb. 1978 - 31 Jul. 1981

Richard F. Buck Hanscom AFB, Mass. AFGL 31 Jul. 1981 200 p refs

(Contract F19628-78-C-0033; AF Proj. 7659)

(AD-A107280; AFGL-TR-81-0203) Avail: NTIS HC A09/MF A01 CSCL 04/2

This report summarizes the services supplied to the Air Force Geophysics Laboratories in support of the upper air research program. Personnel and equipment were supplied at a number of launch sites. Descriptions of airborne payload equipment and special ground support equipment are presented. Airborne equipment included telemetry and related apparatus, including both analog and digital systems. Ground support equipment included autotrack and manual antennas, trajectory determination systems with command capability and PCM decoding and display systems. Author (GRA)

N82-27887# Pennsylvania State Univ., University Park. Ionosphere Research Lab.

IONIZATION AND AEROSOL PARTICULATES IN THE MIDDLE ATMOSPHERE Final Report, 10 Jun. 1978 - 9 Dec. 1980

Leslie C. Hale Oct. 1981 18 p refs

(Grant DAAG29-78-C-0129)

(AD-A107361; PSU-IRL-FR-81/1; ARO-15733.1-GS) Avail: NTIS HC A02/MF A01 CSCL 04/1

The research performed during the course of this Grant included both analysis of previously obtained data and additional experimental work. The principal experimental work involved the preparation and launching of rocket payloads during two solar eclipse expeditions: to Northern Ontario in February, 1979 and

to Kenya in February, 1980. These payloads used blunt conductivity probes to measure atmospheric conductivity, and the changes in conductivity produced by lamps built into the payloads, both visible and ultraviolet. Author (GRA)

N82-27888# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.

THE DETECTABILITY OF HIGH FREQUENCY ENERGY AT TELESEISMIC AND REGIONAL DISTANCES, 1. STUDIES OF RADIATION FROM HIGH-EXPLOSIVE AND NUCLEAR CRATERING EVENTS, 2

Zoltan A. Der and R. R. Blandford 4 Mar. 1981 50 p refs
(Contract F08606-79-C-0007; DARPA Order 2551)
(AD-A111855; SDAC-TR-81-6; VSC-TR-82-2) Avail: NTIS HC A03/MF A01 CSCL 08/11

A survey of the literature on short period seismic studies showed that seismic waves of high frequency in the 3-10 Hz range can be observed regularly at both regional and teleseismic distances. These observations show that the low Q values proposed for the long period seismic waves cannot be valid in the short period band. The data indicate that, in the mantle, Q increases with frequency and may be as much as five times higher at 5-10 Hz than in the long period band. Even with the most conservative assumptions, the level of high frequency amplitudes in the teleseismic P waves exceeds that predicted with a constant $t^*p = 1$ sec by a factor of at least 100,000 at and beyond 5 Hz. The apparent Q beta of the lithosphere, which may be largely due to scattering by the small scale inhomogeneities in the crust, also shows an increase with frequency by as much as a factor of four within the 1-10 Hz band. This parameter controls the attenuation and the detectability of seismic waves at regional distances such as Pn, Pg, Su and Lg. Author

N82-27889*# Aerospace Corp., El Segundo, Calif.

SOFT X-RAYS FROM THE SUNLIT EARTH'S ATMOSPHERE

David L. McKenzie, Hugo R. Rugge, and P. A. Charles 15 Feb. 1982 38 p refs
(Contracts NAS8-33235; NASw-3338; NAS5-23315; CIT-44-727600; F04701-81-C-0082)
(NASA-CR-169090; NAS 1.26:169090; AD-A112214; TR-0082(2940-01)-6; SD-TR-82-04) Avail: NTIS HC A03/MF A01 CSCL 04A

The HEAO-1 A-2 experiment low-energy proportional counters, designed to investigate celestial X-ray sources, were used here to measure the X-ray spectrum of the sunlit Earth in the energy range 0.2-0.8 keV. The X-rays arise by coherent scattering of, or fluorescence of atmospheric constituents by, solar coronal X-rays incident on the atmosphere. Although the relative spectral contributions of the two processes depend upon the Sun-Earth-satellite geometry, fluorescent oxygen and nitrogen K X-ray emission is always important. The observed spectra were compared with calculations in order to derive the coronal temperature and emission measure, parameters that characterize the incident solar spectrum. These derived parameters agree well with the expected values for the nonflaring sun, and good agreement was obtained between measurements closely in time but having a wide range of geometries and counting rates. Thus X-ray observations of the sunlit Earth's atmosphere can be a useful monitor of solar activity for satellite-borne instrumentation unable to view the sun directly. GRA

N82-27890# Air Force Geophysics Lab., Hanscom AFB, Mass.

TEMPORAL AND SPATIAL STRUCTURE OF SHORT WAVELENGTH INFRARED AURORAL BACKGROUNDS Final Scientific Report, 1 Jul. 1977 - 31 Mar. 1981

E. Ray Huppi, Dennis Villanucci (PhotoMetrics, Inc.), and Bruce Marshall (Stewart Radiance Lab.) 13 Oct. 1981 91 p refs
(AF Proj. 7670; DNA Proj. NWET-125AAHX639)
(AD-A112274; AFGL-TR-81-0299; AFGL-ERP-756) Avail: NTIS HC A05/MF A01 CSCL 04/1

Infrared auroral backgrounds in the 3 micron region were measured with a filtered radiometer from a KC-135 aircraft. The measurements of temporal and spatial variations in the infrared were compared with simultaneous measurements of 3914A and 5577A visible radiation. Auroral measurements were obtained during dark and sunlit conditions. Frequency analysis shows the 3 micron and 5577A to be delayed and filtered relative to the prompt 3914A N2(+) emission. The ratio of 3 micron to 3914A emission varies by about a factor of 3 and appears to be a function of peak electron deposition altitude. Author (GRA)

N82-27891# Calspan Advanced Technology Center, Buffalo, N.Y.

AEROSOL COMPOSITION IN THE MARINE AND COASTAL BOUNDARY LAYER

E. J. Mack, J. T. Hanley, R. J. Pilie, C. K. Akers, and B. J. Wattle Aug. 1981 11 p refs Presented at the 25th Ann. SPIE Tech. Symp., San Diego, Calif., 24-28 Aug. 1981
(Contract N00014-81-C-0519)
(AD-A107308) Avail: NTIS HC A02/MF A01 CSCL 04/1

Aerosol composition data obtained in the North Atlantic, in the Mediterranean, in the northern Gulf of Mexico, off the coasts of California, Nova Scotia and Portugal and on shore on Cape Cod and on the North Sea Coast of West Germany are discussed. The data show that the marine aerosol population varies considerably in composition, particularly in coastal areas, and does not necessarily comprise primarily sea salt aerosols. As a result of these compositional differences, response of the aerosol to fluctuations in relative humidity is expected to differ from one locale or airmass to another. Therefore, aerosol size spectra alone are not sufficient for the prediction of visibility or the potential performance of EO systems under changing humidity conditions. Author

N82-27892# SRI International Corp., Menlo Park, Calif.

CHATANIKA RADAR MEASUREMENTS DURING THE AURORAL E PROGRAM

Robert M. Robinson and Richard B. Vondrak Hanscom AFB, Mass. AFGL Jun. 1981 48 p refs
(Contract F19628-81-K-0037; AF Proj. 4643)
(AD-A107117; AFGL-TR-81-0238; SR-1) Avail: NTIS HC A03/MF A01 CSCL 17/9

Chatanika radar electron-density and electric-field measurements were made during the Auroral E rocket program. Four instrumented sounding rockets were launched into the diffuse aurora from Poker Flat Research Range near Fairbanks, Alaska. The radar provided ionospheric data during eight consecutive nights preceding the launch. The radar data from the night of the launch were analyzed to determine the extent and duration of the auroral E layer. The electron density data indicated that the southward advance of the diffuse aurora was consistent with the average shape of the statistical auroral oval. During the rocket launches the E layer was uniform with a maximum density of about 200,000 to 300,000 el/cu. cm at an altitude of 125 km. The energy flux of precipitating electrons was 1.5 to 2.0 ergs/sq. cm-sec. The mean energy of the electrons was inferred to be about 2 keV. Electric fields were northward with a magnitude of 30 mV/m. No auroral arcs were present within the range of the rocket trajectories. GRA

N82-27893# Systems Science and Software, La Jolla, Calif.

SEISMOLOGICAL DISCRIMINATION AND YIELD DETERMINATION RESEARCH Final Report, 30 Sep. 1979 - 30 Sep. 1980

T. C. Bache, T. G. Barker, N. Rimer, J. T. Cherry, W. E. Farrell, R. C. Goff, J. Wang, J. Berger, B. Shkoller, and J. R. Murphy Jun. 1981 94 p refs
(Contract F08606-79-C-0008; ARPA Order 2551)
(AD-A107360; SSS-R-81-5033; VSC-TR-81-21) Avail: NTIS HC A05/MF A01 CSCL 08/11

This report summarizes work conducted by Systems, Science and Software concerning the generation, propagation, detection and analysis of seismic waves by both nuclear explosions and earthquake sources. Specific topics covered included numerical simulation of the near field ground motion from earthquakes and explosions, automatic signal processing relating to the detection of seismic events and magnitude determination, a compilation of near source data and the synthesis of this data in terms of the seismic source function, and the determination of the spectral characteristics of acoustic waves from an explosion near the ocean surface. Author (GRA)

N82-27894*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.

ANALYSIS OF LUNAR LASER RANGING DATA AND

PERFORMANCE AND ANALYSIS OF VLBI OBSERVATIONS FOR GEODETIC PURPOSES Final Report, 1 Oct. 1980 - 30 Sep. 1981

T. A. Herring, R. W. King, R. B. Langley, P. J. Morgan, I. I. Shapiro, and C. C. Counselman, III 17 Dec. 1981 26 p refs
(Grants NGR-22-009-839; Contracts F19628-81-K-0015; DI-14-08-0001-18388; Grants NSF EAR-79-20253; NSF PHY-81-06036; NSF AST-80-22229; AF Proj. 2309)
(NASA-CR-169097; NAS 1.26:169097; AD-A112235; AFGL-TR-81-0358) Avail: NTIS HC A03/MF A01 CSCL 08E

Lunar laser ranging (LLR) observations made by the McDonald Observatory from 1970 through 1980 have been analyzed to estimate the variation of latitude and Universal Time (UT). We have compared these estimates with determinations of Earth rotation from other techniques. For observations obtained in two one-week periods in September and October 1980, during the International 'MERIT' (Measurement of Earth Rotation and Intercomparison of Techniques) Short Campaign, the root-mean-square difference between LLR and very long baseline interferometry determinations of UT was 0.3 milliseconds. We have also used LLR determinations of UT to derive changes in length-of-day (lod) and compared these with changes in lod inferred from changes in the polar component of the Earth's atmospheric angular momentum. A common, persistent approx. 50 day fluctuation was identified in these lod values. GRA

N82-27895# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

THE DOWNWARD CONTINUATION TO THE EARTH'S SURFACE OF TRUNCATED SPHERICAL AND ELLIPSOIDAL HARMONIC SERIES OF THE GRAVITY AND HEIGHT ANOMALIES

Christopher Jekeli Dec. 1981 152 p refs
(Contract F19628-79-C-0027; AF Proj. 2309)
(AD-A112237; SCIENTIFIC-11; AFGL-TR-81-0361; Rept-323) Avail: NTIS HC A08/MF A01 CSCL 08/4

The problem of divergence of the geopotential spherical harmonic series at the Earth's surface is investigated from a numerical, rather than a theoretical approach. It is shown that previous numerical evaluations, based on the expansion of the potential generated by the masses between the point of computation and the bounding sphere, are inconclusive with respect to the magnitude of the downward continuation error that is attributable to series divergence. A more representative model of the Earth's potential is devised on the basis of a density layer, which, in the spherical approximation, generates a gravity field whose harmonic constituents decay according to an accepted degree variance model. This field, expanded to degree 300, and a topographic surface specified to a corresponding resolution of 67 km are used to compute the differences between truncated inner and outer series of the gravity and height anomalies at the surface of the Earth model. Up to degree 300, these differences attain RMS values from 0.33 microgal to 86 microgal for the gravity anomaly and from 0.32 micrometer to 410 micrometer for the height anomaly, in areas ranging respectively from near the equator to the vicinity of the pole. In addition to these values, there is an expected truncation effect, caused by the neglect of higher degree components of the inner series, of about 30 mgal and 36 cm, respectively. GRA

N82-27896# Logicon, Inc., Lexington, Mass.

ANALYSIS AND PROGRAMMING FOR RESEARCH IN THE PHYSICS OF THE UPPER ATMOSPHERE Final Report, 1 Jan. 1980 - 9 Jan. 1982

James N. Bass, Robert L. Geddes, Frank R. Roberts, and Edward C. Robinson 9 Oct. 1981 166 p refs
(Contract F19628-78-C-0209; AF Proj. 9993)
(AD-A113932; AFGL-TR-81-0293) Avail: NTIS HC A08/MF A01 CSCL 04/1

A versatile density model for the upper atmosphere (DENMOD) has been developed to provide quantitative density data. This software package consolidates recent atmospheric density models for convenient usage. Computations in the Jacchia 1977 Model have been streamlined. Methods are presented for comparative evaluations of various recent atmospheric density models, such as those included in DENMOD, with respect to the precision of satellite position predictions. These comparisons are benchmarked by accurate satellite tracking data obtained from CW Doppler beacon measurements. AFGL ephemerides systems are described which provide efficient calculations of satellite orbits expressed in a variety of forms. The utility of these programs has been expanded by adding the capability for performing ancillary calculations. These include evaluation of occultation conditions and viewing conditions for configurations of multiple observing platforms. With addition of magnetic field models which include field line tracing routines, these software systems can be used to evaluate the time-histories of various types of geomagnetic images (or footprints) of satellites as they traverse their orbits. Improvements have been made in the AFGL Rocket Trajectory System, a software system which provides statistical filtering of radar data for rocket launches. New rocket types have been added to the system's repertoire of thrust models. Author (GRA)

N82-27897# Washington Univ., Seattle. Dept. of Electrical Engineering.

MULTIPLE SCATTERING EFFECTS ON TRANSMISSION THROUGH THE ATMOSPHERE Annual Summary Report, 1 Sep. 1981 - 31 Aug. 1982

Akira Ishimaru Apr. 1982 8 p
(Contract N00014-78-C-0725)
(AD-A113546; TR-4-ONR) Avail: NTIS HC A02/MF A01 CSCL 20/14

The transmission characteristics of optical waves with wavelengths in the range of 1 to 15 micrometers through various atmospheric conditions including clouds, fog, turbulence, rain, hail, snow, and inhomogeneous layers are investigated. Plane wave transmission characteristics through fog are considered. Author

N82-27898# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Sciences Div.

PROCEEDINGS OF THE AIR FORCE GEOPHYSICS LABORATORY WORKSHOP ON THE EARTH'S RADIATION BELTS Interim Report

Rita C. Sagalyn, ed., Walter N. Spjeldvik, ed. (Nordmann Research Ltd.), and William J. Burke, ed. 21 Oct. 1981 285 p refs Workshop held at Hanscom AFB, Mass., 26-27 Jan. 1981
(Contract F19628-79-C-0102; AF Proj. 7601)
(AD-A113959; AFGL-TR-81-0311; AFGL-ERP-757) Avail: NTIS HC A13/MF A01 CSCL 04/1

A two-day workshop on the Earth's radiation belts was held on 26-27 January 1981 at the Air Force Geophysics Laboratory. The workshop reviewed the present state of knowledge of the radiation belts and the effects of energetic particles on microelectronic systems. From this perspective it is possible to define the instrumentation requirements of future missions into the radiation belts. Proceedings of the workshop include: (1) reports on a tutorial session concerning the present level of understanding of radiation belt measurements, dynamics, wave-particle interactions, and their effects on microelectronic elements, (2) specifications of the state-of-the art instrumentation required to measure energetic particles, cold plasmas, magnetic fields, and waves, (3) overviews of existing statistical, numerical, and analytical models of the radiation belts, and (4) summaries of the sessions presented at the end of the workshop by the various session chairmen. Author (GRA)

N82-27899# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.

WATER VAPOR: ITS STRUCTURE AND ELECTROMAGNETIC ABSORPTION Special Publication, Jan. - Sep. 1981

Hugh R. Carlon Mar. 1982 36 p refs
(DA Proj. 1L1-61101-A-91A)
(AD-A113647; ARCSL-SP-81025) Avail: NTIS HC A03/MF A01 CSCL 04/1

Research has shown that traditional theories of the structure of vapors are imprecise when applied to strongly hydrogen-bonded substances like water. Presented here are the main points of a new theory, with major emphasis on physical descriptions of the populations, sizes, and size distributions of neutral molecular cluster species in water vapor and moist air that interact with electromagnetic radiation in the atmosphere. From this theory, models are developed that describe the infrared continium

absorption of atmospheric water vapor almost precisely, and extend this modeling to a wide range of temperatures and humidities. Because the new equations are based in fundamental physics, modeling in wavelength regions other than the infrared, e.g., the millimeter- and microwave-regions should be possible if investigators can compute and experimentally verify absorption attributable to modes of the neutral clusters that are effective in the absorption at these wavelengths. It is suggested that the new equations be incorporated into existing atmospheric transmission models. Author (GRA)

N82-27900# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

THE EARTH'S GRAVITY FIELD TO DEGREE AND ORDER 180 USING SEASAT ALTIMETER DATA, TERRESTRIAL GRAVITY DATA AND OTHER DATA

Richard H. Rapp Hanscom AFB, Mass. AFGL Dec. 1981 58 p refs

(Contract F19628-79-C-0027; AF Proj. 2309)

(AD-A113098; DGS-322; SCIENTIFIC-12; AFGL-TR-82-0019) Avail: NTIS HC A04/MF A01 CSCL 08/14

The spherical harmonic expansion of the Earth's gravitational field has been obtained to degree 180 by combining several sources of data. The first data set was an a priori set of potential coefficients to degree 36 based on number of recent solutions including a substantial of resonance terms. A second data set was a 1 x 1 deg anomaly field derived from the SEASAT data set, while the third data set was an updated 1 x 1 deg terrestrial field. The last two fields were combined into one set containing 56761 1 x 1 deg values. The remaining values were computed from the a priori potential coefficients. A rigorous combination solution was not carried out. Instead all anomalies were weighted in such a way that the normal equations were diagonal. The results of the adjustment were 64800 1 x 1 deg anomalies that were expanded into spherical harmonics using the optimum quadrature procedure developed by Colombo. Accuracy estimates for each coefficient were obtained considering noise propagation and sampling error caused by the finite block size in which the anomalies are given. The percentage error of the solution reaches 100% near degree 120. The coefficients and their accuracy to degree 50 are listed in an appendix. GRA

N82-27901# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

THE STUDY OF FACTORS AFFECTING THE PRECISE ESTIMATION OF THE EARTH'S GRAVITY FIELD Final Report, 1 Dec. 1978 - 31 Oct. 1981

Richard H. Rapp Hanscom AFB, Mass. AFGL Dec. 1981 9 p refs

(Contract F19628-79-C-0027; AF Proj. 2309)

(AD-A113137; AFGL-TR-82-0033) Avail: NTIS HC A02/MF A01 CSCL 08/14

This report summarizes the work done in the three year period of the contract. Brief remarks are made concerning research in the following areas: new analysis techniques for data given on a spherical grid: analysis of satellite-to-satellite tracking data; global gravity field modelling; and the vertical datum problem. A complete list of papers and reports produced under contract sponsorship are listed. Author (GRA)

N82-27902# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

STUDY OF GEODETIC AND GEOPHYSICAL PARAMETERS Final Report, 1 Dec. 1978 - 30 Sep. 1981

Urho A. Uotila Hanscom AFB, Ohio AFGL Dec. 1981 33 p refs

(Contract F19628-79-C-0075; AF Proj. 7600)

(AD-A113353; DSG-324; AFGL-TR-82-0018) Avail: NTIS HC A03/MF A01 CSCL 08/5

This report summarizes the research work carried out from December 1, 1978 through September 30, 1981 on an AFGL project directed towards the study of geodetic and geophysical parameters. The final report summarizes the work distributed earlier in twelve scientific and two internal reports. The main areas of research were: reference frames, nutation and polar motion; prediction, estimation and other computational methods in geodesy; general surface representation module designed for geodesy; U.S. gravity reference network; positional errors in inertial navigation and mass point modeling. GRA

N82-27903# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.

GLOBAL GEOPOTENTIAL MODELLING FROM SATELLITE-TO-SATELLITE TRACKING

Oscar L. Colombo Hanscom AFB, Mass. AFGL Oct. 1981 145 p refs Prepared in cooperation with Stuttgart Univ., West Germany

(Contract F19628-79-C-0027; AF Proj. 2309)

(AD-A111872; Rept-317; SCIENTIFIC-10; AFGL-TR-81-0319) Avail: NTIS HC A07/MF A01 CSCL 08/5

The error analysis of the global modelling of the geopotential was carried out up to degree and order 331 of the spherical harmonic expansion, for data from a low-low satellite-to-satellite tracking (SST) mission. The sphericity and the rotation of the Earth are considered, as well as the discrete nature of the data. The expansion of the potential was truncated at degree n = 331. Two theories are been used: least squares adjustment, and least squares collocation; above degree n = 200 the accuracies predicted according to collocation are significantly better than those according to least squares. The processing of SST data to obtain very high resolution models of the gravitational field is discussed. Descriptions and listings of computer programs are included. To reduce the computer time and storage needed to set up and to invert the normal matrix, a somewhat simplified orbital geometry and an approximate model of the data are adopted; no orbit determination errors are considered. An extention of the theory to nonpolar orbits is given. GRA

N82-27904# New Mexico State Univ., Las Cruces. Physical Science Lab.

ENGINEERING, INSTRUMENTATION, SYSTEMS INTEGRATION AND FLIGHT SUPPORT FOR BALLOON OPERATIONS Final Report, 1 Feb. 1979 - 20 Oct. 1981

John R. Ground 15 Jan. 1982 18 p

(Contract F19628-79-C-0081; AF Proj. AE30)

(AD-A113092; AFGL-TR-82-0034) Avail: NTIS HC A02/MF A01 CSCL 04/1

The work performed under this contract consisted of: conducting balloon flight operations from selected sites; integrating government-furnished equipment instrumentation and flight safety equipment into balloon-borne payloads; providing engineering support for payload integration and integrity; fabricating, calibrating and repairing command control/telemetry equipment; analyzing data; and reporting flight results. Author (GRA)

N82-27905# Air Force Geophysics Lab., Hanscom AFB, Mass.

COMPOSITION AND STRUCTURE MEASUREMENTS IN AN IONOSPHERIC BARIUM CLOUD Final Report

R. Narcisi, E. Tracinski, G. Federico, L. Wlodyka, and P. Bench 23 Dec. 1981 31 p refs

(AF Proj. 2310; DNA Proj. 125AAXH)

(AD-A113138; AFGL-TR-82-0003; AFGL-ERP-760) Avail: NTIS HC A03/MF A01 CSCL 04/1

A 48 kg barium payload was launched from Eglin Air Force Base, Florida on 12 December 1980 at 2311 GMT and detonated at 183.7 km. At 2342:50.25 GMT, a second rocket, instrumented with an ion mass spectrometer and pulsed plasma probes, was fired to traverse the barium cloud. Composition, ion density, and structure measurements were acquired up to 241.2 km in both the natural and disturbed ionosphere. The rocket penetrated the barium cloud between 147 and 184 km. In addition to the Ba+, Ba++ produced by H Lyman alpha ionization, and Ca+, an impurity in the barium were detected in the cloud. A peak barium ion concentration of about 6,000,000 ions cu cm was measured at 161 km where the ionospheric NO+ and O2+ ions were essentially eliminated by large recombination loss. The bottom side of the barium cloud had a relatively smooth structure while the top side showed significant density fluctuations. The first experimental evidence of a theoretically predicted E region 'image cloud' was found in the form of an enhanced NO+ layer just below the barium cloud. Unexplained wave-like density variations in O+, NO+, and O2(+) also were seen above the barium cloud to 195 km. A quantitative estimate of the outgassing water vapor concentrations near the payload's surface was made using the fast change transfer rate coefficient

for O+ + H2O yields H2O+ + O that created the observed water vapor ions. GRA

N82-27906# Maryland Univ., College Park. Dept. of Meteorology.

THE IMPLICATION OF EDDY DIFFUSION OF MOMENTUM AND HEAT ON THE UPPER BOUNDARY CONDITION IN ATMOSPHERIC MOTIONS

F. Baer and F. Giwa Jan. 1982 23 p refs
(Contract F19628-78-C-0134; AF Proj. 2310)
(AD-A113087; SR-1; AFGL-TR-82-0040) Avail: NTIS HC A02/MF A01 CSCL 04/1

By analyzing the equations of motion governing atmospheric motion in terms of spectral Hough functions, it is shown that for most of the possible motions in the atmosphere, the often used 'boundary conditions' omega = O or alpha = O at P sub T = O are in fact not true boundary conditions but merely the statement of a somewhat obscure property of the governing equations. For a top pressure P sub T not equal O, these are true mathematical boundary conditions with the following difficulties: There is no obvious physical interpretation; and the resulting motion below is sensitive to the nature of the boundary condition and the level at which it is applied. It is shown that the boundary condition which states that phase velocity should be directed downwards for each of the Hough components is consistent with the dissipative effects of diffusion of momentum and heat. Also with this suggested boundary condition, the motion below is negligibly modified by changing the level at which the boundary condition is applied. Author (GRA)

N82-27907# Royal Inst. of Tech., Stockholm (Sweden).

ON THE DESCRIPTION OF THE PROPERTIES OF FRACTURED ROCK USING THE CONCEPT OF A POROUS MEDIUM

John Stokes May 1980 90 p
(SKBF/KBS-TR-80-05) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

In order to describe the flow of groundwater through fractured rock, water is either assumed to flow through a porous continuum or through discrete fractures between impervious blocks of rock. The latter approach being the one demanding more information on the rock, problems on groundwater flow are usually discussed using the porous medium approach. It is essential that after assuming that a certain flow region acts as a porous medium, we use a procedure for measuring the properties that at the same time gives a test of this assumption. When giving a description of groundwater flow, the goal is often a presentation of pathlines and flowtimes between points of interest and the ground surface. Using a porous medium approach, this means that hydraulic conductivity and porosity must be known through the medium. In order to cope with transient flow, we must also know the time constant governing the development of the flow. A conductivity decreasing with depth will force the pathlines to the surface giving local flow. If the conductivity is constant, the flow is regional. It is therefore important to know the gradient of hydraulic conductivity. Finally, the anisotropic structure of the rock must be known in order to describe the flow. In this report a procedure to measure the properties listed above is developed. DOE

N82-27908# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

TERRESTRIAL SOLAR SPECTRA, SOLAR SIMULATION AND SOLAR CELL EFFICIENCY MEASUREMENT

R. Matson, R. Bird, and K. Emery Sep. 1981 121 p refs
(Contracts EG-77-C-01-4042; DE-AC02-77CH-00178)
(DE82-002082; SERI/TR-612-964) Avail: NTIS HC A06/MF A01

Fundamentals of light transmittance and, both measured and modeled atmospheric effects (i.e., air mass, molecular and aerosal scattering, and absorption) on terrestrial solar spectra are discussed. Geometric effects, such as global rather than direct beam measurements, and detector orientation are also reviewed. The SERI proposed ASTM global and direct beam terrestrial solar spectra are also presented. A detailed review/evaluation of the spectral characteristics of a number of solar simulators is given. Methods of calibrating the short circuit current of a solar cell with respect to a given irradiance spectrum are discussed. In conclusion, the need for a sophisticated solar simulator is proportional to the spectral mismatch betwen the spectral response of the reference cell used to set the solar simulator and that of the test cell. The ASTM terrestrial solar irradiance spectrum is recommended as a reference, spectrum and, the used either filtered xenon arc or dichroic filtered tungsten halogen lamps for solar simulation is also recommended. DOE

N82-27909# Geological Survey, Reston, Va. Office of Energy Resources.

SHALE CHARACTERIZATION AND RESOURCE APPRAISAL OF DEVONIAN BLACK SHALES OF THE APPALACHIAN BASIN Monthly Report for October 1981

Wallace deWitt, Jr. Oct. 1981 12 p
(Contract DE-AI21-79MC-10866)
(DE82-004191; DOE/MC-10866/T10) Avail: NTIS HC A02/MF A01

Department of Energy funds for the US Geological Survey's characterization and approval program were exhausted. Final reports for 4 of the 9 projects of the program were released to METC during FY 1981. Monthly progress reports will continue to be submitted to DOE until the last of the program work is completed and the last of the project final reports submitted to METC. DOE

N82-27910# Woodward-Clyde Consultants, Rockville, Md.

SENSING SYSTEMS FOR MEASURING MECHANICAL PROPERTIES IN GROUND MASSES. VOLUME 5: DUTCH CONE PENETROMETER TESTS: CASE HISTORIES Final Report

R. A. Waitkus, C. R. Burgin, and R. E. Smith Dec. 1981 48 p refs 5 Vol.
(Contract DOT-FHWA-7-3-0158)
(PB82-154576; FHWA/RD-81/113; REPT-77C731) Avail: NTIS HC A03/MF A01 CSCL 08M

Five case histories are cited that demonstrate the usefulness and possible limitations of the Dutch Cone. Comparisons and correlations are made between the cone and other field and/or laboratory tests. Additionally, the results of analysis involving Dutch Cone data are compared to other analysis methods and in some cases observed behavior. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-27911# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

ENVIRONMENTAL CIRCULATIONS ASSOCIATED WITH TROPICAL CYCLONES EXPERIENCING FAST, SLOW AND LOOPING MOTION

Jianmin Xu and William M. Gray May 1982 280 p refs
(Grants NA 79RA-D00002; NSF ATM-79-23591)
(NA79RAD00002; Atmospheric-Science-Paper-346; ISSN-0067-0340) Avail: NTIS HC A13/MF A01

The characteristic large scale flow patterns associated with fast, slow, and looping tropical cyclone motion in the western Atlantic and the western North Pacific are investigated. Cyclones were stratified by their speed. Each class of cyclone motion was further stratified by its position south of, near, or north of the subtropical ridge at 500 mb. Both individual case and composite analyses were performed. Climatological information on each motion class is also provided. Significant differences in the climatology for these three classes of storm motion were observed. Author

N82-27912*# National Aeronautics and Space Administration, Washington, D. C.

RESULTS ON THE VERIFICATION OF SATELLITE DATA BASED ON A COMPARISON WITH RADIOSONDE DATA

G. Steinhorst Mar. 1982 8 p ref Transl. into ENGLISH from Ann. der Meteorologie (West Germany), no. 15, 1980 p 185-186
(Contract NASw-3541)

(NASA-TM-76691; NAS 1.15:76691) Avail: NTIS HC A02/MF A01 CSCL 04B

Results of the verification of satellite wind data are represented by comparing them with radiosonde data for the geostationary satellites METEOSAT, GOES and GMS. The quality of METEOSAT pictures improved, reaching the quality of GOES and GMT wind data. Author

N82-27913*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-3) LAUNCH

Dale L. Johnson, S. C. Brown, and G. W. Batts (Computer Sciences Corp.) Apr. 1982 51 p refs

(NASA-TM-82480; NAS 1.15:82480) Avail: NTIS HC A04/MF A01 CSCL 04B

Selected atmospheric conditions observed near Space Shuttle STS-3 launch time on March 22, 1982, at Kennedy Space Center, Florida are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prlaunch Jimsphere measured vertical wind profiles and the wind and thermodynamic parameters measured at the surface and aloft in the SRB descent/impact ocean area are presented. Final meteorological tapes, which consist of wind and thermodynamic parameters versus altitude, for STS-3 vehicle ascent and SRB descent were constructed. The STS-3 ascent meteorological data tape is constructed. E.A.K.

N82-27914# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE CLIMATOLOGY OF THE MALOJA WIND

W. Moerikofer 10 Feb. 1982 11 p Transl. into ENGLISH from Meteorol. Z. (East Germany), v. 55, no. 6, Jun. 1958 p 215-217

(AD-A112064; FTD-ID(RS)T-1637-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Wind registrations from Sils-Baselgia were accomplished in conjunction with pilot balloon launchers. The recording was conducted by means of contact anemometers on the roof of the western most house of Sils-Baselgia (at the outlet of the Eilser Sea) at 1800 m above sea level. In addition to the recorded wind speeds, wind direction and the weather were noted with respect to visual observations several times daily. Author

N82-27915# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE SEA WIND OF GDANSK (DANZIG)

H. Koschmieder 10 Feb. 1982 20 p Transl. into ENGLISH from Meteorol. Z. (East Germany), v. 52, no. 12, Dec. 1935 p 491-495

(AD-A112065; FTD-ID(RS)T-1638-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

In order to capture the phenomenon of the sea wind in the most complete form possible, a ground network was used. The three stations: airfield, Broesen-Bad and Glettkau-Bad were put into operation and all were equipped with thermohydrographs and gust recorders. Author

N82-27916# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

VERTICAL TEMPERATURE STRATIFICATION OF THE ATMOSPHERE IN AN AREA OF THE HIGH TATRA MOUNTAINS

J. Otruba 18 Feb. 1982 14 p Transl. into ENGLISH from Internationale Tagung fuer Alphine Meteorologie (East Germany), v. 9, 1966 p 283-292

(AD-A112066; FTD-ID(RS)T-1566-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Aerological measurements were made at 1 a.m. at the aerological station Poprad, situated at 709 m above sea level on the southern slope of the High Tatras, the highest peaks of which reach a height of about 2500 to 2650 m. The vertical thermal stratification was analyzed up to an elevation of 3000 m above sea level. Author

N82-27917# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CLIMATOLOGIC CHARACTERIZATION OF THE SUHOVEI WIND IN THE ROMANIAN PLAINS

F. Fetov, El Mihel, and St. Cristescu 25 Feb. 1982 26 p refs Transl. into ENGLISH from a mono. from C.S.A. Inst. Meteorol., Colegere de Lucrari ale Inst. Meteorol., Bucharest, 1963 p 377-394

(AD-A112067; FTD-ID(RS)T-1723-81) Avail: NTIS HC A03/MF A01 CSCL 04/2

Traits of the dry wind called Suhovel are described as having the characteristic relative humidity (under shelter) of < or = 30%, the air temperature (under shelter) of > or = 25 C, and a wind velocity (determined with a wind vane) of > or = 5 m/s. Author

N82-27918# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

WIND PATTERNS AROUND THE TARCU MASSIF

Constantin Trenia and Cristescu Stefania 25 Feb. 1982 18 p refs Transl. into ENGLISH from C.S.A. Inst. Meteorologic, Culegere de Lucrari ale Inst. Meteorologic, pe anul 1965 (Romania), 1967 p 311-321

(AD-A112073; FTD-ID(RS)T-1725-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

The wind occurrence and the speed characteristics spotted between 1961 and 1965 at the weather station on top of the Tarcu Massif are given. Author

N82-27919# Pennsylvania State Univ., University Park. Dept. of Meteorology.

ESTIMATION OF VERTICAL WIND SHEAR FROM INFRARED AND MICROWAVE RADIANCES Final Report

Hans A. Panofsky, Anthony Cavalier, John J. Cahir, and Frederick Gadomski Jan. 1982 77 p refs

(Contract N00014-80-C-0115)

(AD-A112823; NEPRF-CR-82-01) Avail: NTIS HC A05/MF A01 CSCL 04/2

Linear regression estimates of radiosonde observed vertical wind shears between mandatory levels were made, using radiance gradients obtained via the TIROS-N satellite as predictors in a pilot experiment based on about 200-500 observations. The best results were obtained for shears between 850 mb and a level in the upper troposphere such as 300 mb. Results were similar for 850-400 or 850-200 mb shears, but notably inferior for 850-500 mb shears. The linear correlation coefficients between estimated and smoothed observed components of shear was about 0.70, corresponding to about 50 percent explained variance in independent test samples. Somewhat higher explained variances (about 0.60) were achieved in a limited trial where the data-set was stratified according to subjectively-judged trajectory curvature. Estimates of the wind itself in the upper troposphere were nearly as skillful as the best shear results. Overall, with the possible exception of curvature-stratified estimates in clear regions, both wind and wind shear estimates are not likely to be superior to methods that generate RMS wind errors of order 5/ms. GRA

N82-27920# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

A QUANTITATIVE TECHNIQUE FOR SHORT RANGE WEATHER FORECASTING USING NUMERICAL WEATHER PREDICTION GUIDANCE AND DIGITAL SATELLITE IMAGERY

Norman E. Buss Hanscom AFB, Mass. Air Force Geophysics Lab. Mar. 1981 64 p refs

(Contract F19628-78-C-0207; AF Proj. 6670)

(AD-A112234; AFGL-TR-81-0206) Avail: NTIS HC A04/MF A01 CSCL 04/2

A method is outlined to test the concept of 'Focasting', proposed by Vonder Haar, et al. (1979), by comparing forecast cloud fields to existing satellite observed cloud fields to examine the accuracy of the forecast. Forecast cloud fields are derived from a set of multiple linear regression coefficients which can then be used to predict what the cloud field should look like at a given forecast valid time, say at one hour intervals from the LFM base time out to 12 hrs. Then by comparing real-time satellite imagery, as it is received at one hour intervals, to the corresponding estimated satellite product (ESP) that was produced from the regression equations, the forecaster can see how well the forecast c'oud field fits the actual satellite imagery. The positioning of the forecast cloud field can then be adjusted,

based on the deviation from the observed satellite field.
Author (GRA)

N82-27921# Wisconsin Univ., Madison. Space Science and Engineering Center.
STUDIES IN OBJECTIVE FORECASTING OF MESOSCALE WEATHER USING AN INTERACTIVE COMPUTER SYSTEM Final Report, 1 Jun. 1978 - 30 Sep. 1981
Thomas M. Whittaker and Donald R. Johnson Dec. 1981 16 p refs
(Contract F19628-78-C-0137; AF Proj. 6670)
(AD-A112316; AFGL-TR-81-0364) Avail: NTIS HC A02/MF A01 CSCL 04/2

Work under this contract involving weather inference from GOES data and weather prediction is summarized. The research involved extrapolation and advection of meteorological events, a statistical study relating GOES data to surface thunderstorm observations, and investigating satellite indicators of short term changes in surface visibility. Author

N82-27922# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A COMPUTATIONAL STUDY OF THE MODIFICATION OF RAINDROP SIZE DISTRIBUTION IN SUBCLOUD DOWNDRAFTS Ph.D. Thesis
Robert George Borchers Aug. 1981 161 p refs
(AD-A107262; AFIT-CI-81-44D) Avail: NTIS HC A08/MF A01 CSCL 04/2

A computational study is made of the variation of steady state raindrop size distributions (0.004 cm less than or equal to radius less than or equal to 0.40 cm) in adiabatic subcloud downdrafts of constant magnitude. The cloud base drop size distribution is assumed to be Marshall-Palmer. The microphysical processes progressively introduced are evaporation, collision coalescence, aerodynamic and collisional breakup of drops. Collision coalescence and breakup area treated through a stochastic model. Thermodynamic and hydrometeoric variables of temperature, relative humidity, total liquid water, rainfall rate and radar reflectively are computed as functions of height below cloud base along with the drop size distributions. It is found that evaporation tends to deplete, as expected, the smaller members of the droplet population. Computed raindrop size distributions agree quite well with measured maritime raindrop spectra reported in the literature, the agreement being better for the higher precipitation rates measured. Author

N82-27923# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DETERMINATION OF ICE CRYSTAL GROWTH PARAMETERS IN A SUPERCOOLED CLOUD TUNNEL M.S. Thesis
Mike Wayne Kowa Jun. 1981 146 p refs
(AD-A107263; AFIT-CI-81-36T) Avail: NTIS HC A07/MF A01 CSCL 08/12

A supercooled cloud tunnel was developed. It demonstrated the capability of accurately simulating the crystal growth under free fall conditions in a natural supercooled cloud. The new vertically converging design for the working/observation section of the tunnel permits ice crystals to be stably suspended in a supercooled cloud airstream for indefinite lengths of time. A new fog chamber is used to make the supercooled fog homogeneous with respect to droplet number and concentration, and temperature, before entering the working/observation section. A method has been developed by which the moisture content in the supercooled fog can be controlled and held contant. The flow rate through the working/observation section is controlled by a specially designed valve which also maintains the total flow into the chamber at a constant level. This configuration keeps the supercooled fog condition constant throughout an experimental run. Author

N82-27924# Federal Aviation Administration, Atlantic City, N.J.
TEST AND EVALUATION OF THE AIRPORT RADAR WIND SHEAR DETECTION SYSTEM Final Report, Mar. 1978 - May 1981
Dominick L. Offi, William Lewis, Tai Lee, and Alfred DeLaMarche Feb. 1982 39 p refs
(FAA Proj. 022-242-830)
(AD-A112663; DOT/FAA/CT-81/63; FAA-RD-81-85) Avail: NTIS HC A03/MF A01 CSCL 17/9

A wind shear detection system, developed to operate with airport surveillance radar ASH-(8), was installed and tested. Initial tests consisted of hardware and software shakedown and feasibility determinations. Second phase tests compared radar with aircraft and tower winds, evaluated the wind shear measurement capability under various weather conditions, and investigated the effectiveness of a simple two azimuth pointing strategy. Final efforts consisted of observations in all weather regimes and tests of a modified velocity azimuth display (VAD) and a glide slope scan. Results showed the system was compatible with and operate satisfactorily with the ASR-8. The processing and spectral display of clear air and precipitation returns is feasible. The accuracy of agreement, between radar measured winds and components of the aircraft measured winds in both radially oriented flights and runway offset flights using a two azimuth pointing technique, a glide slope scan, and a modified VAD was examined. GRA

N82-27925# Naval Environmental Prediction Research Facility, Monterey, Calif.
A CLIMATOLOGY OF THE REFRACTIVE INDEX STRUCTURE FUNCTION PARAMETER, Cn(2), IN THE NORTH ATLANTIC OCEAN REGION Final Report
Terry Brown and Andreas K. Goroch Jan. 1982 98 p refs (WF59551)
(AD-A112515; NEPRF-TR-82-01) Avail: NTIS HC A05/MF A01 CSCL 04/2

The optical refractive index structure function parameter, Cn(2), describes the effects of turbulence on optical propagation. Surface boundary layer turbulence models are used to calculate monthly mean values and standard deviations of Cn(2) in the North Atlantic Ocean. Cn(2) statistics are presented as isopleths of mean values and standard deviations for day, night, and diurnally averaged values. Author (GRA)

N82-27926# Naval Postgraduate School, Monterey, Calif.
A TWO-DIMENSIONAL FINITE ELEMENT ADVECTION MODEL WITH VARIABLE RESOLUTION M.S. Thesis
Mark Elwood Older, III Jun. 1981 83 p refs
(AD-A107511) Avail: NTIS HC A05/MF A01 CSCL 04/2

Many meteorological forecast applications require the use of grids that have a high resolution in a particular area of interest, while allowing coarser resolution elsewhere. Conventional finite difference models often use nested grids to this end. In recent years, finite element models have been offered as an alternative. In this study, the two dimensional advection equation with diffusion is defined over a rectangular domain. The Galerkin technique is applied to linear basis functions on triangular elements. The model is tested to determine the sensitivity of the forecast to various nodal geometries. Both equilateral and right triangular elements are tested. It is found that the equilateral arrangement consistently yields a superior forecast. Other tests are conducted in which the resolution is varied smoothly versus abruptly over the domain. The smoothly varying case gives results that are dramatically improved over the abruptly varying case. Among the conclusions is the fact that, for a given maximum resolution, the more slowly and smoothly the element size is changed, the better the forecast obtained. Author (GRA)

N82-27927# Naval Postgraduate School, Monterey, Calif.
A NUMERICAL STUDY OF THE ROLE OF AIR SEA FLUXES IN EXTRATROPICAL CYCLOGENESIS Ph.D. Thesis
Scott Alphonse Sandgathe Sep. 1981 135 p refs
(AD-A107508) Avail: NTIS HC A07/MF A01 CSCL 04/2

This study uses a numerical model to investigate the effect of the air-sea fluxes of sensible heat and moisture in extratropical cyclogenesis over the open ocean. The model is a sectorized version of the UCLA general circulation model including the Arakawa-Schubert cumulus parameterization scheme and the Randall version of the Deardorff planetary bondary layer parameterization. Idealized initial conditions are specified in the atmosphere and ocean that are typical of open-ocean fall and spring conditions. Adiabatic and diabatic model results are compared over a 15-day integration period. Diabatic processes, including the surface fluxes, cause a large reduction in low-level static stability during the initial cyclone growth period. This reduction in static stability, as well as the latent heat release,

leads to the rapid growth of wave numbers 12 and 18 in the diabatic model experiment, while only wave number 6 is present in the adiabatic experiment. The growth of the cyclones is much more rapid in the diabatic experiment. However, cyclones in the adiabatic experiment attain similar maximum intensities as in the diabatic experiment, and undergo an analogous decay period. GRA

N82-27928# Wisconsin Univ., Madison. Space Science and Engineering Center.

CHARACTERISTICS OF WATER VAPOR TRACKED WINDS Final Report

Frederick R. Mosher and Tod Stewart Monterey, Calif. Naval Environmental Prediction Research Facility Nov. 1981 57 p refs

(Contract N00014-80-C-0632; F59553)

(AD-A113651; NEPRF-CR-81-06) Avail: NTIS HC A04/MF A01 CSCL 04/2

Wind measurements were obtained by tracking water vapor features on METEOSAT and GOES/VAS 6.7 micron water vapor images. While pure water vapor features are fuzzy, there are discernible features which can be tracked. An investigation of preprocessing algorithms designed to bring out the features to be tracked showed that high pass filters tended to ring out the noise in the image, while low pass filters washed out the features. Equal population gray scale stretching enhanced both the water vapor features and the cloud features. Sliced linear gray scale stretching under operator control gave the best enhancement to the water vapor features. The height assignment of water vapor features is uncertain. The feature is in the middle troposphere, but can vary between 500 mb and 700 mb. Rather than assign all the winds at an arbitrary height, an attempt was made to infer the water vapor height from the cloud heights and motions as compared to the water vapor motions. Water vapor tracking was done interactively using the Man-Computer Interactive Data Access System (MCIDAS). S.L.

N82-27929# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE VISIOCEILOMETER: A PORTABLE VISIBILITY AND CLOUD CEILING HEIGHT LIDAR Final Report

W. J. Lentz Jan. 1982 46 p refs

(DA Proj. 1L1-62111-AH-71)

(AD-A113650; ERADCOM/ASL-0105) Avail: NTIS HC A03/MF A01 CSCL 04/2

A hand-held visibility and cloud ceiling height lidar based on the AN/GVS-5 laser rangefinder will be described. This militarized, battery-operated lidar automatically calculates visibility based on the Klett solution of the lidar equation. Visibilities from 10 to 199,999 m and cloud ceiling heights from 50 to 3000 m may be calculated. The measurements from this visioceilometer have been favorably compared to visibilities derived from larger lidars, balloon-borne particle counters, and transmissometers. The entire unit weighs less than 14 lb. Author (GRA)

N82-27930# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F. RICKENBACKER ANGB, COLUMBUS, OHIO Final Report

5 Mar. 1982 479 p

(AD-A113717; AD-E850157; USAFETAC/DS-82/016) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Rickenbacker Air National Guard Base, Columbus, Ohio. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27931# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

OTIS AFB, FALMOUTH, MASSACHUSETTS. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

5 Feb. 1982 460 p

(AD-A113716; AD-E850155; USAFETAC/DS-82/010) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Otis AFB, Falmouth, Massachusetts. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27932# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F. WATERLOO MAP, IOWA Final Report

8 Feb. 1982 479 p

(AD-A113715; AD-E850154) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Waterloo Municipal Airport, Iowa. It contains the following parts: (1)Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27933# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F. BARKSDALE AFB, SHREVEPORT, LOUISIANA Final Report

12 Feb. 1982 461 p

(AD-A113714; AD-E850159; USAFETAC/DS-82/014) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Barksdale AFB, Shreveport, Louisiana. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27934# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F. FORT WAYNE, BAER FIELD, INDIANA Final Report

1 Feb. 1982 475 p
(AD-A113718; AD-E850156; USAFETAC/DS-82/009) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Fort Wayne, Baer Field, Indiana. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27935# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F. KEESLER AFB, BILOXI, MISSISSIPPI Final Report
8 Feb. 1982 448 p
(AD-A113703; AD-E850153; USAFETAC/DS-82/013) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Keesler AFB, Biloxi, Mississippi. It contains the following parts: (1)Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27936# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
AUSTIN STRAUBEL APT, GREEN BAY, WISCONSIN. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F. AUSTIN STRUABEL APT., GREEN BAY WISCONSIN Final Report
15 Mar. 1982 479 p
(AD-A113705; AD-E850151; USAFETAC/DS-82/017) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Austin Straubel Airport, Green Bay, Wisconsin. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, snowfall and snow depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet bulb temperature depression versus dry bulb temperature, means and standard deviations of dry bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure summary (means, standard, deviations, and observation counts of station pressure and sea level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occuring tables. GRA

N82-27937# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Data Processing Div.
COLUMBUS AFB, MISSISSIPPI. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report
16 Feb. 1982 456 p
(AD-A113713; AD-E850158; USAFETAO-DS-82/015) Avail: NTIS HC A20/MF A01 CSCL 04/2

Surface weather observations for Columbus AFB, Mississippi are summarized. Weather conditions and atmospheric phenomena; precipitation, snowfall and snow depth (daily amounts and extreme values); surface winds; ceiling versus visibility and sky cover; psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet bulb temperature depression versus dry bulb temperature, means and standard deviations of dry bulb, wet bulb and dew point temperatures and relative humidity); and pressure summary (means, standard, deviations, and observation counts of station pressure and sea level pressure). Data are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency or occurring tables. Author

N82-27938# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology and Physical Oceanography.
LOW-ORDER MODELS OF ATMOSPHERIC CIRCULATIONS
Edward N. Lorenz Feb. 1982 45 p refs
(Contract F19628-81-K-0001)
(AD-A113003; SR-1; AFGL-TR-82-0066) Avail: NTIS HC A03/MF A01 CSCL 04/2

Low-order models (LOM's), which are systems of ordinary differential equations which have been simplified by extreme reduction of the number of dependent variables, are often capable of representing atmospheric processes in a qualitatively correct manner. With a LOM it is generally possible to obtain a much more extended time-dependent solution, or a much larger ensemble of solutions, than would be economically feasible with a larger model. A general procedure for constructing LOM's is described. A selection of LOM's is presented, to illustrate the many forms which these models may take and the many uses to which they may be put. The step-by-step construction of a LOM is illustrated with a model of the large-scale circulation of a moist atmosphere. GRA

N82-27939# Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
A STUDY OF HORIZONTAL SEA SURFACE TEMPERATURE VARIABILITY M.S. Thesis
William Aubrey Butler Dec. 1981 66 p refs
(AD-A113838) Avail: NTIS HC A04/MF A01 CSCL 08/10

The horizontal variability of 'patchiness' in sea surface temperature structure is examined on length scales between 0.6 and 76.8 kilometers. A primary purpose was to test the hypothesis that atmospheric forcing is a cause of horizontal temperature variance on these length scales. Using continuous sea surface temperatures acquired in the Central North Pacific Ocean, spectra were computed for temperature variance. The variability in these spectra on seasonal, synoptic, and diurnal periods was then examined and correlated with changes in atmospheric conditions. Important results found included a seasonal dependence for the patchiness structure, a negative correlation between surface temperature variance and wind speed on a synoptic time scale, and a diurnal variability in patchiness that may be explained by solar insolation and turbulent heat exchange with the atmosphere. In conclusion, a strong atmospherically controlled temporal variability in the small scale horizontal sea surface temperature variance is found and may explain inconsistencies in earlier observational and theoretical studies. Author (GRA)

N82-27940# Naval Postgraduate School, Monterey, Calif.
ONE-DIMENSIONAL MODEL PREDICTIONS OF UPPER OCEAN TEMPERATURE CHANGES BETWEEN SAN FRANCISCO AND HAWAII M.S. Thesis
Edward F. Steiner Dec. 1981 80 p refs
(AD-A113837) Avail: NTIS HC A05/MF A01 CSCL 08/10

Previous tests of one dimensional oceanic mixed layer models have generally used long time series of data at specific locations, such as at the ocean weather ships. In this work the Garwood model was used to make a series of predictions of upper ocean thermal structure changes along the shipping track between San Francisco and Hawaii, from 1 January to 16 December 1978. The initial and verifying ocean temperature profiles provided by the National Marine Fisheries Service, were objectively analyzed on a space-time grid, where the spatial dimension was along the shipping track. The grid resolution is 100 km and 15 days, which defines the basic prediction increment. The ocean mixed layer model was driven with the winds and heat fluxes derived

from the Fleet Numerical Oceanography Center's atmospheric analyses. A preliminary check of local heat balance was made by comparing the observed change in heat content with the accumulated surface heat flux. Comparison of the observations and the 1-d mixed layer model predictions shows a large variability in model performance. Relatively good predictions were made during periods of shallowing or unchanging mixed layer depth, while poorer prediction occur during periods of rapid deepening. Variability along the track indicates superior performance in the subtropical region, with prediction accuracy decreasing in the region of the subtropical front and the California Current, where physical processes not included in the model are relatively large. Author (GRA)

N82-27941# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

CLOUD FORECAST SIMULATION MODEL

Roger C. Whiton, Emil M. Berecek, and John C. Sladen Oct. 1981 134 p refs

(AF Proj. 2339)

(AD-A113540; AD-E850149; USAFETAC/TN-81/004) Avail: NTIS HC A07/MF A01 CSCL 04/2

The cloud forecast simulation model generates synthetic worldwide 3- hour total cloud cover forecast fields at 50-nautical mile resolution. The synthetic forecasts are generated stochastically, based on input verifying 'observed' total cloud cover fields, in such a manner that the agreement between the synthetic cloud forecast field and its verifying observed field is no better or worse than the agreement between actual cloud prognoses and their verifying observations. Moreover, a sawtooth wave submodel is used to insure the synthetic cloud forecast fields have the same spatial correlation as actual cloud prognoses have. Thus, the cloud forecast simulation model generates synthetic total cloud cover forecast fields that have the same skill and spatial correlation as the operational forecast product has. The model is used to generate meteorological input to system planning and optimization simulations and system design studies. The sawtooth wave submodel could also be used to generate synthetic two dimensional observed weather fields as well as cloud forecasts. GRA

N82-27942# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

HECTOR APT, FARGO, NORTH DAKOTA. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F Final Report

11 Jan. 1982 500 p

(AD-A113156; AD-E850137) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Hector APT, Fargo, North Dakota. It contains the following parts: (1) Weather Conditions; Atmospheric Phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-27943# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

JACKSONVILLE IAP, FLORIDA. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO)). PARTS A-F Final Report

28 Dec. 1981 445 p

(AD-A113157; AD-E850138) Avail: NTIS HC A19/MF A01 CSCL 04/2

Surface weather observations for Jacksonville IAP, Florida are summarized. Weather conditions and atmospheric phenomena; precipitation, snowfall, and snow depth (daily amounts and extreme values); surface winds; ceiling versus visibility and sky cover; psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet bulb temperature depression versus dry bulb temperature, means and standard deviations of dry bulb, wet bulb and dew point temperatures and relative humidity; and pressure summary (means, standard, deviations, and observation counts of station pressure and sea level pressure) are discussed. Data are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. Author

N82-27944# Chicago Univ., Ill. Dept. of Geophysical Sciences.

THEORETICAL STUDIES OF SQUALL-LINE TYPE AND TORNADO LIKE DISTURBANCES IN THE ATMOSPHERE Final Report, Nov. 1979 - Nov. 1981

H. L. Kuo, W. H. Raymond, and K. Seitter 16 Dec. 1981 135 p refs

(Contract F19628-80-C-0012)

(AD-A113086; AFGL-TR-82-0005) Avail: NTIS HC A07/MF A01 CSCL 04/2

A multi-two dimensional squall line model is constructed by approximating the three dimensional variable by the sum of three components which can be considered as its projections in the three orthogonal planes when taken alone, and use the maturely dependent set of two dimensional equations to represent the three dimensional flow. Condensation and precipitation processes are also included. A wide variety of numerical simulations may be performed with this model. The question of the upshear slope of the squall line type thunderstorm is investigated separately by using the pure two dimensional version of the model. Influence of the fictitious side boundaries is minimized by the use of a radiation condition based on the phase velocity of the disturbance. The question of the conditions that lead to the development of the two-cell type vortex motion with descending motion at the center is attacked by extending Kuo's similarity solutions to higher order in z. Author (GRA)

N82-27945# Colorado State Univ., Fort Collins.

FEASIBILITY ANALYSIS OF CLOUD FIELD PROPERTY INFERENCE FROM BROADBAND RADIOMETRY Final Report, 25 Feb. - 30 Sep. 1981

Stephen K. Cox Sep. 1981 79 p refs

(Contract F19628-81-K-0006; AF Proj. 2688)

(AD-A113133; AFGL-TR-81-0352) Avail: NTIS HC A05/MF A01 CSCL 04/2

The goal of the study was to explore the capabilities of using passive radiometry to infer descriptive information about an overlying or underlying cloud field. Specific information includes cloud cover, cloud top height and cloud base height, as sensed by airborne broadband radiometers. The cloud information derived from implementation of passive radiometry will be used in tactical planning and as boundary conditions for short term meteorological prediction models. Author (GRA)

N82-27946# Maryland Univ., College Park. Dept. of Meteorology.

OPTIMAL SPATIAL REPRESENTATIONS FOR NUMERICAL WEATHER PREDICTION MODELS BASED ON NORMAL MODE ANALYSES Final Report, Jun. 1978 - Sep. 1981

F. Baer and P.-J. Sheu Jan. 1982 90 p refs

(Contract F19628-78-C-0134; AF Proj. 2310)

(AD-A113135; AFGL-TR-82-0028) Avail: NTIS HC A05/MF A01 CSCL 04/2

A method is devised to determine the computational errors associated with space truncation in numerical weather prediction models. This method is based on evaluating the normal modes of the linearized form of the prediction model. The modes are separated into their physical and computational parts. A special procedure has been devised to make this separation definitive. It is the computational modes which give rise to computational errors. To reduce the impact of these modes, their contributions are filtered out of the initial data used to begin a forecast. Although computational mode amplitude will develop during integration because of nonlinearity, the impact of the computational errors can be controlled by the filtering technique described here. If initial filtering is not adequate, additional filtering may be applied periodically throughout the integration period. Author (GRA)

N82-27947# Danish Meteorological Inst., Copenhagen.
THE CLIMATE OF DENMARK. SUMMARIES OF OBSERVATIONS FROM LIGHT VESSELS. PART 2: WAVES AND CURRENTS AT THE SURFACE
Agnes Sparre 1982 228 p
(DMI-Climatol-Papers: ISBN-87-7478-197-9) Avail: NTIS HC A11/MF A01

Standard observations carried out in the waters around Denmark are presented as monthly tables. Data include highest wave heights, cumulative percentage frequency of wave heights, and means of wave heights at different wind directions and forces. Current velocities with annual and monthly vector means are given as are highest monthly recorded current velocities.
Author (ESA)

N82-27948# Illinois State Water Survey, Champaign.
EVALUATION OF ILLINOIS WEATHER MODIFICATION PROJECTS OF 1976-1980: A SUMMARY
Stanley A. Changnon and Chin Fei Hsu 1981 35 p refs
(Grant NSF ATM-79-05007)
(PB82-154436; ISWS/CIR-148/81) Avail: NTIS HC A03/MF A01 CSCL 04B

Statistical and meteorological assessments of five summer weather modification projects in Illinois are summarized. The projects assessed were among eight one summer weather modification projects in Illinois, each of which attempted to increase summer rainfall through cloud seeding with silver iodide. All the projects involved meteorological forecasting and direction of the cloud seeding, aircraft for cloud base and mid-cloud seeding, and a weather radar for operations and data collection.
S.L.

N82-27949# National Weather Service, Fort Worth, Tex. National Hurricane Center.
SOME EMPIRICAL RULES FOR FORECASTING FOG AND STATUS OVER NORTHERN FLORIDA, SOUTHERN GEORGIA AND ADJACENT COASTAL WATERS
Emmett L. Ricks Aug. 1981 15 p refs
(PB82-154006; NOAA-TM-NWS-SR-104; NOAA-81111608) Avail: NTIS HC A02/MF A01 CSCL 04B

Strong low-level winds, especially strong vertical wind shear, generate and maintain enough mixing below the subsidence inversion over southern Georgia and northern Florida to counteract, or inhibit, low stratus and fog formation. Weaker northeast and east winds flavor low stratus and fog formation over southern Georgia and northern Florida when the trajectory is from the Atlantic coast.
GRA

N82-27950# National Weather Service, Silver Spring, Md.
WATCH/WARNING VERIFICATION: FLASH FLOOD, WINTER STORM AND HIGH WIND (1980)
A. Kristine Campbell Sep. 1981 42 p ref
(PB82-148719; NOAA-TM-NWS-FCST-26; NOAA-81103007) Avail: NTIS HC A03/MF A01 CSCL 04B

To develop a better measure of watch/warning forecast performance, Weather Service forecast offices have provided national headquarters with verification logs on flash floods, winter storms and high winds since January 1979. These logs consist of issue time valid time lead time area, verification for watches and warnings, and events that occur in the absence of a watch or warning. A total of 448 flash flood, 216 winter weather and 117 high wind events were reported on the logs in 1980. GRA

N82-27951# Indian Inst. of Tropical Meteorology, Poona.
SOME ASPECTS OF OCEANIC ITCZ AND ITS DISTURBANCES DURING THE ONSET AND ESTABLISHED PHASE OF SUMMER MONSOON STUDIED WITH MONEX-79 DATA
D. R. Dikka, D. K. Paul, and S. V. Singh Mar. 1981 29 p refs
(PB82-145624; R-032) Avail: NTIS HC A03/MF A01 CSCL 04B

Aerological data collected by conventional and special observational platforms during the field phase of Summer Monex-79 are analyzed. The characteristic features of the near equatorial oceanic intertropical convergence zone (ITCZ) during the pre-onset/onset, as well as the established phase of the monsoon and its superimposed disturbances are documented based on the analysis of data at 700 mb. The onset phase ITCZ is characterized by a narrow shear zone having maximum cyclonic vorticity, convergence, colder temperature, high moisture content and is also the region of convective weather.
GRA

N82-27952# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
STATE OF MARYLAND BAINBRIDGE METEOROLOGICAL STATION: PROCESSING AND ARCHIVING OF DATA
Vanda T. Freeman and Edward A. Davis Jul. 1981 87 p refs
Sponsored in part by Maryland Dept. of Natural Resources
(PB82-147448; PPSP/JHU-PPSE-9-1) Avail: NTIS HC A05/MF A01 CSCL 04B

Observations from a meteorological station at Bainbridge, Maryland, from December 1977 through July 1979 are reported. The purpose of the station was to develop a meteorological data base to be used by the power plant siting program in assessing the environmental impacts of operating a power plant at the site. The processing and archiving of the data collected from the three levels of the 180 foot tower are described. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-27953# National Research Inst. for Oceanology, Stellenbosch (South Africa). Coastal Engineering and Hydraulics Div.
TABLES FOR THE APPLICATION OF VOCOIDAL WATER WAVE THEORY
D. H. Swart Jan. 1981 130 p refs
(CSIR-T/SEA-8010) Avail: NTIS HC A07/MF A01

The determination of wave period for a given wavelength is discussed. Combined shoaling and refraction are considered. Calculation of wave characteristics with vocoidal theory is provided. Time and space dependent vocoidal functions are discussed. Hyperbolic functions are also discussed.
N.W.

N82-27954# National Research Inst. for Oceanology, Stellenbosch (South Africa). Coastal Engineering and Hydraulics Div.
THE EFFECT OF BED SLOPE ON WAVE CHARACTERISTICS
R. C. Nelson Jun. 1981 94 p refs
(CSIR-RR-372) Avail: NTIS HC A05/MF A01

An experimental program designed to assess and to quantify the influence of slope on the characteristics of nonbreaking waves is described. Slopes as small as 0.015 can have a marked influence on wave characteristics, and that for slopes less than or equal to 0.100 these influences can be described by simple functional relationships.
Author

N82-27955# Texas Univ., Austin.
SOME APPROACHES TO THE ANALYSIS AND INTERPRETATION OF WIDE ANGLE BOTTOM LOSS DATA
Gregory D. Ingram 15 Feb. 1982 196 p refs
(Contract N00014-78-C-0329)
(AD-A112708; ARL/TR-82-11) Avail: NTIS HC A09/MF A01 CSCL 08/10

Wide angle bottom loss data in terms of ocean sediment acoustic properties are analyzed and interpreted. Bottom loss data collection and the state of the art knowledge of relevant ocean bottom properties are reviewed, and a filter description of the acoustic signal is developed illustrating the effects of the source waveform and ghosts on travel time versus grazing angle plots. These effects are identified and it is shown that they severely distort the ocean bottom impulse response. The autocorrelation and power cepstrum are examined for their usefulness in extracting geoacoustic information from the multiple bottom bounce data. The autocorrelation is initially preferred due to several reasons having to do with the fact that it has the superposition with respect to convolution: (1) the shape of events are more interpretable in terms of the phase of the time components; (2) the amplitudes of events are more predictable; and (3) the effects of coherent noise are more recognizable.
Author

N82-27956# Oregon State Univ., Corvallis. School of Oceanography.
EXPOSURE. A NEWSLETTER FOR OCEAN TECHNOLOGISTS, VOLUME 9, NUMBER 4
Roderick Mesecar Sep. 1981 9 p
(Contract N00014-79-C-0004; NR Proj. 083-103)
(AD-A107104) Avail: NTIS HC A02/MF A01 CSCL 09/2

The complete text of the Serial ASCII Instrumentation Loop (SAIL) data communications standard as drafted by technical members of the marine research community is presened. Science leadership is based on the widespread availability of instrumentation. In most instances, new instrumentation techniques enable a tenfold or greater speed in data collections, and in other instances allow the measurements for experiments before inaccessible. Although this standard has other instrumentation applications, it is presented as one candidate specifically for intravessel digital communications from sensors that monitor vessel parameters (position, speed, heading, etc.). However, standardization contributes to efficiency and technology dissemination because standards form' the root words of a language for technical information transfer. E.A.K.

N82-27957# Coastal Engineering Research Center, Fort Belvoir, Va.
PREDICTION OF WAVE REFRACTION AND SHOALING USING TWO NUMERICAL MODELS
Jon M. Hubertz Aug. 1981 16 p refs
(AD-A107241; CERC-CETA-81-12) Avail: NTIS HC A02/MF A01 CSCL 08/3

Two numerical models to predict wave refraction and shoaling in shallow water are described. One model is formulated in terms of wave rays, the other in terms of wave spectra. Output from each model is illustrated and computed with observations. Author

N82-27958# Naval Research Lab., Washington, D. C. Physical Oceanography Branch.
HIGH SOLITARY WAVES IN WATER: A REFINED NUMERICAL METHOD Interim Report
James M. Witting and John M. Bergin 30 Sep. 1981 19 p refs
(AD-A107041; NRL-8504) Avail: NTIS HC A02/MF A01 CSCL 12/1

Formerly, finite difference calculations of solitary wave properties gave results different from those obtained from independent methods. Calculations based on an expansion in powers of a small quantity, supplemented by the use of Pade approximates, and calculations based on an integral equation for the wave profile are in satisfactory agreement, except possibly for the highest waves. This report refines and extends a numerical method based on Fourier series solutions of the governing equations. The resultant solitary wave properties agree with those found by independent methods to several significant figures, except for waves having amplitudes within a few percent of that of the highest wave. There appears to be little degradation in the method's accuracy for the highest and very high waves, when compared to waves of intermediate height. This report discusses possible reasons for the failure of other numerical work to achieve high accuracy. Author (GRA)

N82-27959# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
GUIDE TO R2D2-RAPID RETRIEVAL DATA DISPLAY
C. A. Pearson May 1981 156 p refs
(PB82-150384; NOAA-TM-ERL-PMEL-29; NOAA-81102101) Avail: NTIS HC A08/MF A01 CSCL 08C

The R2D2 is a set of FORTRAN programs, linked by a procedure file for rapid retrieval and display of hydrographic, current meter, and pressure gauge data. Data are stored as random access disk files for rapid access and sorting. Programs are interactive and have graphics capability. A wide range of display and analysis outputs are available. Including time series plots, data listings, statistics, spectral and tide analysis, empirical orthogonal function analysis, and maps of properties. GRA

N82-27960# Woods Hole Oceanographic Institution, Mass. Dept. of Physical Oceanography.
THE VERTICAL STRUCTURE OF THE WIND-DRIVEN CIRCULATION Ph.D. Thesis
William R. Young Oct. 1981 220 p refs
(Grant NSF OCE-78-25692)
(PB82-148065; WHOI-81-89) Avail: NTIS HC A10/MF A01 CSCL 08C

The physical mechanisms which determine the three dimensional structure of the currents in the Sverdrup interior of a wind-driven gyre are discussed. A variety of simple analytic models suggest that the subsurface geostrophic contours in a wind gyre are closed and so the flow in these regions is not determined by lateral boundary conditions. Instead a turbulent, quasigeostrophic extension of the Batchelor-Prandtl theorem suggests that the potential vorticity is uniform inside these laterally isolated regions. The progagation of Rossby wave trains through slowly varying forced means flows is examined by solving the linearized potential vorticity equation. Finally, shear dispersion in an oscillatory velocity field, similar to that of an inertial oscillation, is discussed. GRA

N82-27961*# Woods Hole Oceanographic Institution, Mass. Dept. of Physical Oceanography.
A FOUR-DIMENSIONAL PRIMITIVE EQUATION MODEL FOR COUPLED COASTAL-DEEP OCEAN STUDIES
Dale B. Haidvogel Oct. 1981 32 p refs
(Grant NAG5-8)
(NASA-CR-169102; PB82-139395; NAS 1.26:169102; WHOI-81-90) Avail: NTIS HC A03/MF A01 CSCL 08C

A prototype four dimensional continental shelf/deep ocean model is described. In its present form, the model incorporates the effects of finite amplitude topography, advective nonlinearities, and variable stratification and rotation. The model can be forced either directly by imposed atmospheric windstress and surface pressure distributions, and energetic mean currents imposed by the exterior oceanic circulation; or indirectly by initial distributions of shoreward propagation mesoscale waves and eddies. To avoid concerns over the appropriate specification of 'open' boundary conditions on the cross-shelf and seaward model boundaries, a periodic channel geometry (oriented along-coast) is used. The model employs a traditional finite difference expansion in the cross-shelf direction, and a Fourier (periodic) representation in the long-shelf coordinate. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-27962*# Department of Agriculture, College Station, Calif. Pest Control Equipment and Methods Research Unit.
PREDICTING THE TIMING AND POTENTIAL OF THE SPRING EMERGENCE OF OVERWINTERED POPULATIONS OF HELIOTHIS spp Final Report, 1 Oct. 1980 - 31 Mar. 1981
Albert W. Hartstack, John A. Witz, and Juan D. Lopez 31 Mar. 1981 36 p refs
(NASA Order T-4629H)
(NASA-CR-167444; NAS 1.26:167444) Avail: NTIS HC A03/MF A01 CSCL 06C

Current literature was reviewed in detail. Temperature and day length are the primary factors which program H. spp. larva for possible diapause. Mortality during diapause is reported as highly variable. The factors causing mortality are identified. Sufficient data was collected to allow the development of mathematical models which predict the timing of emergence. Timing predictions compare favorably to observed field data; however, prediction of actual numbers of emerging moths was not possible. The potential for use of spring emergence predictions in pest management applications, as an early warning of potential crop damage, are excellent. Research requirements to develop such an early warning system are discussed. T.M.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-27963*# National Aeronautics and Space Administration, Washington, D. C.

THE EVALUATION OF STUDIES OF FLIGHT PERSONNEL OF THE GERMAN LUFTHANSA ON THE QUESTION OF STRESS DURING FLIGHTS ON THE SHORT EUROPEAN ROUTES

K. E. Klein, H. Bruener, P. Kuklinski, S. Ruff, and H. M. Wegmann Feb. 1982 39 p refs Transl. into ENGLISH from German report Rept-DLR-355-74/2 DFVLR, Oberpfaffenhofen, West Germany, 1972 34 p Original language document announced as N77-80915 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76660; NAS 1.15:76660) Avail: NTIS HC A03/MF A01 CSCL 06S

Medical studies were undertaken on the stress experience by the cockpit crew working the short routes in Europe and a special attempt was made to discover whether signs of a summation of stress due to flight work become visible during a circuit of several days. For this purpose the pulse and respiratory rates were determined for 22 crew members as an indication of the acute stress occurring during the flight and the amount of stress hormone in the urine as an indication of the extent of total stress in an extended study period. Author

N82-27964*# Tennessee Univ., Memphis. Materials Science Toxicology Labs.

TOXICITY OF THERMAL DEGRADATION PRODUCTS OF SPACECRAFT MATERIALS Final Report, 10 Nov. 1980 - 9 May 1982

W. H. Lawrence, J. E. Turner, Caroline Sanford, Sam Foster, Eula Baldwin, and Jacqueline OConnor 7 May 1982 138 p refs

(Contract NAS9-15670)

(NASA-CR-167615; NAS 1.26:167615) Avail: NTIS HC A07/MF A01 CSCL 06T

Three polymeric materials were evaluated for relative toxicity of their pyrolysis products to rats by inhalation: Y-7683 (LS 200), Y-7684 (Vonar 3 on Fiberglass), and Y-7685 (Vonar 3 on N W Polyester) Criteria employed for assessing relative toxicity were (1) lethality from in-chamber pyrolysis, (2) lethality from an outside-of-chamber pyrolysis MSTL Procedure, and (3) disruption of trained rats' shock-avoidance performance during sub-lethal exposures to in-chamber pyrolysis of the materials. Author

N82-27965# Beth Israel Hospital, Boston, Mass. Orthopedic Biomechanics Lab.

FRACTURE AND VISCOELASTIC CHARACTERISTICS OF THE HUMAN CERVICAL SPINE KINEMATICS OF THE 3 ACTUATOR SYSTEM

W. C. Hayes, A. A. White, W. T. Edwards, and J. Lelli Aug. 1981 135 p refs

(Contract F49620-81-K-0010; AF Proj. 2312)

(AD-A110980; AFOSR-82-0041TR) Avail: NTIS HC A07/MF A01 CSCL 06/19

An analysis of the actuator kinematics and the load generation capabilities was performed. The kinematic behavior of the Planar Motion Material Testing (PMMTA) actuators was analyzed using a computational algorithm written for a MINC-11-03 computer and a TK4010 plotting terminal. The analysis addressed: (1) the range of motion of the test stage considering various angular orientations of the test stage for the most acceptable design, and (2) the calculation of max loads in the vertical, horizontal and rotational directions for each position of the test stage. Author

N82-27966# Army Aeromedical Research Lab., Fort Rucker, Ala.

PREVALENCE OF ASTIGMATISM AMONG AVIATORS AND ITS LIMITING EFFECT UPON VISUAL PERFORMANCE WITH THE AN/PVS-5 FLIGHT VISION GOGGLES

Hanson J. Kim 2 Mar. 1982 7 p

(AD-A112836) Avail: NTIS HC A02/MF A01 CSCL 06/5

Emphasis on sustained operations during periods of darkness is steadily increasing. Presently, the AN/PVS-5 Night Vision Goggles (NVG) are utilized for night operations. The primary concern with these goggles is the astigmatism criterion since this, unlike spherical refractive errors, is not compensated by the NVG. The NVG have only an adjustable range of +2.00 to -6.00 diopters to correct for spherical error. No provisions were incorporated into the design of the NVG to allow correction of astigmatic error. Consequently, an aviator with a significant amount of astigmatism will have reduced visual acuity which will affect his operational performance. A study was undertaken to identify the number of rated aviators at the Army Aviation Center with detected astigmatism in order to assess the magnitude of this particular problem and to determine whether or not the current standards for astigmatism are sufficient for the aviators who are using the AN/PVS-5 Night Vision Goggles. GRA

N82-27967# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Psychology.

EYE MOVEMENTS AND VISUAL INFORMATION PROCESSING Final Report

Eileen Kowler 16 Dec. 1981 12 p refs

(Contract F49620-81-K-0008; AF Proj. 2313)

(AD-A112399; AFOSR-82-0137TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

Eye movements determine the location and velocity of the retinal image. Thus, to understand how we see it is necessary to understand both how eye movements are controlled and how they affect visual information processing. The proposed research is concerned with both problems, specifically: (1) the effect of expectations on smooth eye movements; (2) the effect of saccades and saccade-like stimulus perturbations on visual information processing; and (3) programming sequences of saccades. GRA

N82-27968# Utah State Univ., Logan. Dept. of Biology.

AN EVALUATION OF LOCALIZED SWEATING RATES FOR PREDICTING TOTAL BODY SWEATING RATES Final Scientific Report

James A. Gessaman Dec. 1981 31 p refs

(Grant AF-AFOSR-0276-80; AF Proj. 2312)

(AD-A111902; AFOSR-82-0109TR) Avail: NTIS HC A03/MF A01 CSCL 06/19

This project accessed the accuracy of estimating whole body sweating rates (WBSR) from local sweating rates (LSR) measured with sweat collection capsules containing filter paper. Sweat was collected in capsules strapped on five locations of the body: (1) midforehead, (2) superiorflexor side of the right forearm, (3) left pectoralis major, (4) medial midsection of the left thigh, and (5) upper medial side of the left calf. Sweating rates of 10 male subjects were measured while they rested at an air temperature of 39.4 C and 58.4% RH, and while they ran on a treadmill at a work output of 60% VO2 max with an air temperature of 35.5 C and 33.2% RH. Among all subjects the WBSR averaged 4.3147 g/min sq m during rest and 7.6062 g/min sq m during exercise. The LSR from any one of the five locations was a poor predictor of WBSR. Multiple regression equations which included LSRs from all five locations gave an r squared > 90 for 5 subjects during rest and exercise. The multiple regression equations derived from the data combined from all subjects was not as good a predictor of WBSR as some of the equations derived for individual subjects, i.e., r squared = 70.3 for data during rest and r squared = 46.1 for data during exercise. Four equations which weighted the LSRs with the corresponding skin area factors provide a poor estimate of WBSR (r squared = 53.9). Author (GRA)

N82-27969# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.

LONG BONE AND JOINT RESPONSE TO MECHANICAL LOADING Final Report, 1 Apr. 1979 - 30 Sep. 1981

Ali Erkan Engin Nov. 1981 165 p refs

(Contract F49620-79-C-0110; AF Proj. 2312)

(AD-A111551; AFOSR-82-0013TR) Avail: NTIS HC A08/MF A01 CSCL 06/16

The research program presented in this report is concerned with collection of active muscle force and moment response

data of the human upper and lower extremities when the extremities are subjected to various external forces. The major components of the specially designed and built experimental apparatus are a subject restraint system, a force application device which employs three sonic emitters, and an upper arm (or upper leg) cuff with four sonic emitters. The sonic emitters are utilized to determine the three dimensional direction and the location of the force application on the limbs and the orientation of the limbs with respect to the torso. Kinematics of relative motion between two body segments is presented in a format suitable for utilization of four sonic emitters on the moving body segment. The numerical results are presented from a set of experiments conducted on three male and three female subjects to determine their active muscle resistance against the external forces to dislodge their limbs from the initial or so-called stowed position. It is concluded that although there are intra- and inter-subject variations for the maximum values of the resistive muscle force and moment data for the limbs, there are some trends one can establish for the behavior of their magnitudes. GRA

N82-27970# Office of Naval Research, London (England).
THE BIOLOGICAL EFFECTS OF NONIONIZING RADIATION
J. B. Bateman 29 Dec. 1981 23 p refs Presented at the 10th L. H. Grey Memorial Conf., Oxford, 13-16 Jul. 1981
(AD-A111898; ONRL-C-12-81) Avail: NTIS HC A02/MF A01 CSCL 06/18

This is a critical report on the L.H. Grey Memorial Conference held in Oxford, 13-16 July 1981. The Conference was entitled 'Biological Action of Radiofrequency, Microwave and Ultrasonic Radiations.' The report provides a background identifying the field of interest in broader terms, intended for the general reader. It is then pointed out that the conference was mainly directed toward research and practice related to the possible value of nonionizing radiations in cancer therapy. There were, however, tutorial lectures of a fairly general character and some discussion of biological effects not necessarily arising from production of heat in irradiated tissues. Author (GRA)

N82-27971# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FINITE ELEMENT ANALYSIS OF THE VISCO-ELASTIC INTERACTION OF THE ANNULUS FIBROSIS AND NUCLEUS PULPOSIS WITHIN THE HUMAN INTERVERTEGRAL JOINT M.S. Thesis
Leslie J. Allen Dec. 1981 96 p refs
(AD-A111161; AFIT/GAE/AA/81D-1) Avail: NTIS HC A05/MF A01 CSCL 06/16

An understanding of the mechanical properties and behavior of the intervertebral disc is critical to several current areas of research. Among these are the study of the effects of extreme gravitational forces on the air crews of high performance aircraft and the related problem of spinal injuries due to aircraft ejection. This study was undertaken in order to construct a realistic analytical model of the intervertebral joint using the finite element approach. Experiments have shown that healthy intervertebral joints exhibit creep when subjected to axial load. The focus of this investigation is the behavior and interaction of the nucleus and annulus under loading. An axisymmetric finite element model is employed which incorporates a linear visco-elastic constitutive relation for the annulus and nucleus, based upon a three-parameter Kelvin solid. The visco-elastic constants are found by matching one-dimensional axial experimental data with this two dimensional model. The nucleus, which is composed of a series of concentric lamellae of collagen fibers, has been modelled as a 12ply structure of orthotropic material. GRA

N82-27972# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SLEEP AND WAKEFULNESS HANDBOOK FOR FLIGHT MEDICAL OFFICERS
A. N. Nicholson (Inst. of Aviation Medicine, Fernborough, England) and Barbara M. Stone (Inst. of Aviation Medicine, Fernborough, England) Mar. 1982 89 p
(AGARD-AG-270(E); ISBN-92-835-1416-5) Avail: NTIS HC A05/MF A01

Sleep and wakefulness related to aircrew and the aviation environment are discussed. Eight topics are covered: alertness and sleep, sleep, Circadian rhythms, shiftwork, transmeridian flight, air operations and irregularity of work, disorders of sleep and arousal, and hypnotics. N.W.

N82-27973# Intermagnetics General Corp., Guilderland, N.Y.
FEASIBILITY STUDY: NMR IMAGING MICROSCOPE Final Report, 1 Sep. 1980 - 28 Feb. 1981
W. V. House 24 Apr. 1981 114 p refs
(Grant NSF DAR-80-09739)
(PB82-125915; NSF/PCM-81006) Avail: NTIS HC A06/MF A01 CSCL 06B

The influences of probe geometry were analyzed and quantified for the very small dimensions and high magnetic fields required to examine individual cells and to explore the fundamental differences between normal and abnormal cells for both research and diagnostics. The possibility of sharpening the resonance frequency and improving resolution by simulating the nuclei with appropriate time dependent radio frequency pulses were studied. Analysis shows that the theoretically obtainable resolution in an NMF microscope is limited by Brownian motion of the resonating nuclei along the field gradient that defines surfaces of constant magnetic field. To opitimize resolution, it is necessary to shorten the time duration during which the gradient is applied. Consideration of signal to noise characteristics shows that the best practically obtainable resolution is about 2 pi times greater than the theoretical limit. GRA

N82-27974# South Carolina Univ., Columbia. Dept. of Epidemiology and Biostatistics.
EPIDEMIOLOGY FEASIBILITY STUDY: EFFECTS OF NOISE ON THE CARDIOVASCULAR SYSTEM Final Report
Shirley J. Thompson Sep. 1981 199 p refs
(Contract EPA-6801-6274)
(PB82-147752; EPA-550/9-81-103) Avail: NTIS HC A09/MF A01 CSCL 06S

World literature to date and a critical analysis of existing foreign and domestic epidemiological research on the nonauditory physiological effects of noise are reviewed. Literature on hypertension, cardiovascular disease, and general stress are analyzed for its applicability to noise effects epidemiology. Information and recommendations pertinent to substantive and methodological issues related to the design and conduct of future noise effects epidemiology is also provided. GRA

N82-27975# South Carolina Univ., Columbia.
EPIDEMIOLOGY FEASIBILITY STUDY: EFFECTS OF NOISE ON THE CARDIOVASCULAR SYSTEM: APPENDIX B: ANNOTATED BIBLIOGRAPHY. LITERATURE. THE EFFECTS OF NOISE ON THE CARDIOVASCULAR SYSTEM
Shirley J. Thompson Jul. 1981 248 p
(Contract EPA-68-01-6274)
(PB82-147760; EPA-550/9-81-103B) Avail: NTIS HC A11/MF A01 CSCL 06S

A bibliography of the world literature on the epidemiologic studies of the effect of noise on the cardiovascular system in man is presented. The assignment of numerical scores and ratings are discussed in the narrative report accompanying this bibliography. The assessment criteria employed, the assessment forms devised for standardization of the critiques and summarizations of the evaluations are included. GRA

N82-27976# South Carolina Univ., Columbia.
EPIDEMIOLOGY FEASIBILITY STUDY: EFFECTS OF NOISE ON THE CARDIOVASCULAR SYSTEM. APPENDIX C: REVIEW OF NON-NOISE RELATED RESEARCH OF CARDIOVASCULAR DISEASE
Julian E. Keil, David M. Propert, and Shirley J. Thompson Jul. 1981 103 p refs
(Contract EPA-68-01-6274)
(PB82-147778; EPA-550/9-81-103C) Avail: NTIS HC A06/MF A01 CSCL 06S

Information about the pathology, pathogenesis, and epidemiology of cardiovascular diseases is reviewed. The key cardiovascular diseases, their manifestations, risk factors, etiology of the risk factors and origin of the precipitants of the diseases are discussed. An empirical foundation for subsequent noise related research is

provided: (1) current knowledge of the pathogenesis and pathophysiology of the cardiovascular diseases; (2) key confounding and interactive factors to be considered in the design of future studies; and (3) pathways in the pathogenic process and potential entry points for investigation of noise as the environmental influence on the cardiovascular system are included. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-27977# Navy Personnel Research and Development Center, San Diego, Calif.

PERFORMANCE TEST OBJECTIVITY: A COMPARISON OF RATER ACCURACY AND RELIABILITY USING THREE OBSERVATION FORMS Technical Report, Dec. 1979 - Apr. 1980

William A. Nugent, Gerald J. Laabs, and Robert C. Panell Feb. 1982 31 p refs
(ZF63522001)
(AD-A111077; NPRDC-TR-82-30) Avail: NTIS HC A03/MF A01 CSCL 05/9

The study examined two variables that may influence the consistency and accuracy of rater's judgments in evaluating job performance: (1) the precision with which behaviors to be observed and evaluated are specified on a performance observation form; and (2) the level of proficiency of the rater at the task being evaluated. Videotapes were prepared that depicted both passing and failing performances in the use of two types of electronic test equipments. The videotapes were observed in two experiments by raters who used a structured, semistructured, or unstructured performance observation form. Rater skill level was determined by the score the rater obtained on a performance test that consisted of the same types of electrical measurement problems as shown on the videotape. For both experiments, the presence of at least some structure in a performance observation form produced more accurate and reliable evaluations of job task performance than did a form with no structure. Within the range of rater skill tested, results showed that the level of skill proficiency that raters have with a particular type of electronic test equipment is largely independent of their ability to judge accurately and consistently the performance of others in using the same equipment. Author (GRA)

N82-27978# Dunlap and Associates, Inc., La Jolla, Calif.

TRAINING IMPROVEMENTS FOR THE TACTICAL AIRCREW TRAINING SYSTEM (TACTS): PROJECT SUMMARY REPORT Final Report, Aug. 1978 - Aug. 1980

A. P. Ciavarelli, A. M. Williams, and G. R. Stoffer Orlando, Fla. Naval Training Equipment Center Sep. 1981 47 p refs
(Contract N61339-78-C-0136)
(AD-A107003; NAVTRAEQUIPC-78-C-0136-3) Avail: NTIS HC A03/MF A01 CSCL 05/9

This report presents summarized information related to the Tactical Aircrew Combat Training System (TACTS) training improvements program. The two major sections of the report area addressed to: (1) a description of a computer based TACTS debrief system, referred to as the Performance Assessment and Appraisal System (PAAS), and (2) a problem definition study of air intercept missile (AIM) envelope recognition training. The preliminary design of a computer based system has been completed and a single design module, Performance Assessment and Combat Effectiveness (PACE), is ready for operational test and evaluation. Summarized information from a more comprehensive study of U.S. Navy air-to-air missile envelope training problems is included. Recommendations for improving fleet envelope recognition training are reviewed. Author (GRA)

N82-27979# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.

EFFECT OF TASK DURATION ON VOICE RECOGNITION SYSTEM PERFORMANCE

John W. Armstrong and Gary K. Poock Sep. 1981 71 p refs
(AD-A107442; NPS55-81-017) Avail: NTIS HC A04/MF A01 CSCL 05/8

This report describes an experiment examining voice recognition performance when subjects were required to make a decision every 1.5 seconds for 20 consecutive minutes while speaking to a voice recognizer at the same time. Results showed mental loading degraded voice recognition performance. Results also showed performance degradation similar to a vigilance decrement over eight trials of 2.5 minutes each. Author (GRA)

N82-27980# Naval Postgraduate School, Monterey, Calif.

EFFECT OF OPERATOR MENTAL LOADING ON VOICE RECOGNITION SYSTEM PERFORMANCE

Gary K. Poock and J. W. Armstrong Aug. 1981 60 p refs
(Contract N00039-80WR-09041)
(AD-A107477; NPS55-81-016) Avail: NTIS HC A04/MF A01 CSCL 05/8

This report describes an experiment in which military officers used voice recognition under various mental loading conditions. Results showed voice recognition performance degraded as mental loading was imposed on the subjects. Author (GRA)

N82-27981# Pittsburg Univ., Pa. Learning Research and Development Center.

EMPIRICAL STUDIES OF PROCEDURAL FLAWS, IMPASSES, AND REPAIRS IN PROCEDURAL SKILLS

Kurt VanLehn 5 Feb. 1982 75 p refs Prepared in cooperation with Xerox Palo Alto Research Center
(Contract N00014-79-C-0215; RR042060A; NR Proj. 667-430)
(AD-A113791; TR-ONR-8) Avail: NTIS HC A04/MF A01 CSCL 05/9

This report represents the results of several extensive empirical studies. A group of 925 students who were in the process of learning subtraction were tested using highly diagnostic tests developed by DEBUGGY. Some students were retested two days later to measure the short-term stability of bugs, and others were retested several months later to study long-term stability. All tests were analyzed by DEBUGGY and by several expert diagnosticians in order to assess DEBUGGY'S diagnostic abilities. It was found that DEBUGGY was as good as or better than human diagnosticians at discovering bugs that explain a student's errors. However, a third of the students who committed errors could not be modelled with bugs and slips. Moreover, bugs were found in general to be unstable rather than stable, both in the short term and the long term. These findings challenged the belief that bugs and slips alone could account for procedural error data. Repair Theory was orginally developed as a generative theory of bugs, one that predicted which bugs would exist for a given procedural skill. However, it also predicted that certain kinds of non-bug, non-slip performance would exist, both in the static analyses and the stability data. GRA

N82-27982# Texas Christian Univ., Fort Worth. Inst. of Behavioral Research.

ORGANIZATIONAL CLIMATE: ANOTHER LOOK AT A POTENTIALLY IMPORTANT CONSTANT

Lawrence R. James 7 Apr. 1982 35 p refs
(Contract N00014-80-C-0315; NR Proj. 170-904)
(AD-A113953; IBR-82-4) Avail: NTIS HC A03/MF A01 CSCL 05/10

Organizational climate is examined from the standpoint of the need to demonstrate interrater reliability (agreement) among individuals' perceptions of psychological climate. It is shown that if prior estimates of interrater reliability are accurate, then organizational climate is a moot issue. It is then demonstrated that at least some prior estimating procedures likely provided underestimates of interrater/perceptual agreement. A new procedure for estimating interrater reliability is suggested and illustrated. The new procedure provided substantially higher estimates of interrater reliability than prior methods. It is concluded that the concept of organizational climate is potentially salvageable, although more attention needs to be given to the appropriate level of explanation for climate variables. Author (GRA)

N82-27983# Texas Instruments, Inc., Dallas. Central Research Labs.

INTELLIGENT TUTORING FOR PROGRAMMING TASKS:

USING PLAN ANALYSIS TO GENERATE BETTER HINTS Final Report, 30 Sep. 1980 - 31 Dec. 1981
James R. Miller, Thomas P. Kehler, Paul R. Michaelis, and William R. Murray Mar. 1982 117 p refs
(Contract N00014-80-C-0828; NR Proj. 154-458)
(AD-A114020; TI-08-82-010; ONR-TR-0818F) Avail: NTIS HC A06/MF A01 CSCL 05/9

This project has dealt with tutorial systems for computer programming languages, particularly, systems in which a student is trying to write a computer program and can, upon request, receive hints about errors in his program and ways he can correct these errors. This research had two phases: an experimental investigation of the interaction between a student and a hint-giving tutor, and the construction of a tutorial system that identifies the plan underlying a student's program and gives hints that address errors in this plan. In the experimental work, an existing programming language tutor (BIP) was modified to allow students to request and receive hints from a human tutor. These experiments suggested that: (1) Programs are typically written in two stages: layout of the basic design of the program and (2) correction of the statements that instantiate this design. Systems that rely on 'canned' hints do not provide adequate assistance for the complex problems faced by students. Although BIP was able to give reasonable help on the syntactic form of language statements, it has no facilities for identifying and offering advice on problems with a program's design; in these experiments, students recognized this shortcoming and relied upon assistance from the human tutors. GRA

N82-27984# Vanderbilt Univ., Nashville, Tenn. Dept. of Psychology.
THE CONSTANCY OF STEREOSCOPIC DEPTH PERCEPTION
Robert H. Cormack 12 Jan. 1982 39 p refs
(Contract N00014-81-C-0001)
(AD-A111484) Avail: NTIS HC A03/MF A01 CSCL 05/10

Depth constancy is said to occur when the apparent depth in a scene remains the same as viewing distance changes. Studies of depth constancy have left unanswered questions regarding the range of viewing distances over which depth constancy can operate and the role of retinal disparity in preserving apparently constant depth. In this study, stereoscopic after images were exploited to confront these questions. After images containing depth information in the form of retinal disparity were produced and viewed at various fixation distances. Apparent depth in the afterimage was measured by asking observers to set a depth probe equidistant to the after image. This technique permitted holding retinal disparity constant as viewing distance changed. It allowed testing at very large viewing distances in the presence of multiple depth cues. The results indicate that stereoscopic depth constancy can be preserved at viewing distances at least as great as 27 meters (the largest used). These changes were veridical and demonstrate that the relationship between perceived depth and retinal disparity is consistent with the geometry describing stereopsis. These findings set requirements for theories of depth constancy. Specifically, they demand that such theories show how retinal disparity can be correctly recalibrated on the basis of distance information available in the visual array.
Author (GRA)

N82-27985# Forschungsinstitut fuer Anthropotechnik, Bonn (West Germany).
DESIGN AND VALIDATION OF A TRACKING TEST FOR FORMING MATCHED GROUPS FOR CONTINUOUS TRACKING EXPERIMENTS
F. D. Pitrella and W. Krueger Aug. 1981 29 p refs In ENGLISH; GERMANY summary
(FB-49) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karslruhe, West Germany DM 10

A tracking performance test was developed and used in forming matched groups. The need for such a matching test and the advantages of matched groups over randomized groups of subjects in experimental designs are discussed as well as the preference for between-subjects over within-subjects designs. Matching test reliability was measured (0.99) and predictive and matching validities were determined in a validation experiment. Validation coefficients of 0.79 were obtained which are considerably higher than necessary to prefer matched groups to randomized groups. The strategy used in developing this matching test is explained and may be useful to those who wish to develop their own matching tests for specific research purposes.
Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-27986*# United Technologies Corp., East Hartford, Conn.
STUDY OF EVA OPERATIONS ASSOCIATED WITH SATELLITE SERVICES Final Report, Aug. 1981 - Jan. 1982
Jack O. Nash and Richard D. Wilde Apr. 1982 176 p refs
(Contract NAS9-16120)
(NASA-CR-167614; NAS 1.26:167614) Avail: NTIS HC A09/MF A01 CSCL 05H

Extravehicular mobility unit (EMU) factors associated with satellite servicing activities are identified and the EMU improvements necessary to enhance satellite servicing operations are outlined. Areas of EMU capabilities, equipment and structural interfaces, time lines, EMU modifications for satellite servicing, environmental hazards, and crew training are vital to manned Eva/satellite services and as such are detailed. Evaluation of EMU capabilities indicates that the EMU can be used in performing near term, basic satellite servicing tasks; however, satellite servicing is greatly enhanced by incorporating key modifications into the EMU. The servicing missions involved in contamination sensitive payload repair are illustrated. EVA procedures and equipment can be standardized, reducing both crew training time and in orbit operations time. By standardizing and coordinating procedures, mission cumulative time lines fall well within the EMU capability. S.L.

N82-27987*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE HUMAN ROLE IN SPACE
Stephen B. Hall, George vonTiesenhausen, and Gary W. Johnson Apr. 1982 37 p refs
(NASA-TM-82482; NAS 1.15:82482) Avail: NTIS HC A03/MF A01 CSCL 05H

Requirements for the future human role in space are considered. Human tasks were divided into normal scheduled activities, unscheduled activities, and contingency activities. A strawman mission model was developed. Projections were made of crew size, mission duration, pressurized spacecraft volume, and power requirements. Trends of human roles were likewise projected. N.W.

N82-27988*# Purdue Univ., Lafayette, Ind. Dept. of Food, Nutrition and Horticulture.
PLANT DIVERSITY TO SUPPORT HUMANS IN A CELSS GROUND-BASED DEMONSTRATOR
J. M. Howe and J. E. Hoff Jun. 1982 51 p refs
(Grant NsG-2401)
(NASA-CR-166357; NAS 1.26:166357) Avail: NTIS HC A04/MF A01 CSCL 05H

Factors that influence the human nutritional requirements envisioned in a controlled ecological life support system ground-based demonstrator and on bioavailability experiments of Ca, Fe and Zn are discussed. The interrelationhip of protein and magnesium on Ca retention is also described. Author

N82-27989# Army Natick Development Center, Mass. Individual Protection Lab.
DEVELOPMENT OF A MICROCLIMATE COOLING SYSTEM FOR COMBAT VEHICLES
Vincent D. Iacona, Joseph S. Cohen, Michael Kupcinskas, Diego Gorbea, and Joseph Fratantuono Feb. 1982 33 p refs
(DA Proj. 1G2-63747-D-669)
(AD-A112017; NATICK/TR-82/010; IPL-248) Avail: NTIS HC A03/MF A01 CSCL 06/17

This report describes a study conducted at Yuma Proving

Ground, Arizona. Trained acclimated soldiers conducted simulated combat missions in a stationary M-1 tank, while wearing Chemical Biological (CB) clothing. Physiological measurements, skin temperature, rectal temperature, heart beat rate and sweat production were continuously monitored. In addition, the environmental parameters of wet bulb, dry bulb, and wet bulb globe temperature and wind velocity and relative humidity were recorded. GRA

N82-27990# Hughes Aircraft Co., El Segundo, Calif. Radar Systems Group.
HOLOGRAPHIC LASER VISOR MOCK-UP Final Report
M. J. Chern, T. L. Dobbs, and G. E. Moss Jun. 1981 66 p
(Contract N62269-79-C-0288)
(AD-A112422; HAC-REF-E6018) Avail: NTIS
HC A04/MF A01 CSCL 06/17

The goal of this program was to show that a holographic reflector added to a pilot's visor can provide laser eye protection which has advantages over that which can be provided by other means such as the addition to an absorbing dye. GRA

N82-27991# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REFERENCE BOOK FOR THE NITROGEN INDUSTRY WORKER, VOLUME 2
M. A. Minovich, Ye. Ya. Melnikov, V. A. Klevke, S. D. Fridmen, B. P. Melnikov, V. F. Sokolova, M. I. Kopyev, V. A. Ulina, T. N. Sharonova, I. D. Nefedova et al 19 Mar. 1982 647 p refs Transl. into ENGLISH of Spravochnik Azotchika (USSR), v. 2, 1969 p 1-445
(AD-A113749; FTD-ID(RS)T-1465-80) Avail: NTIS
HC A99/MF A01 CSCL 07/10

Materials and equipment used in the production of nitric and of nitrogen fertilizers are discussed. The physical chemical properties of ammonium nitrate, calcium nitrate, potassium nitrate, sodium nitrate, sodium nitrite, ammonium sulfate, and carbamide are examined as well as of ammonia water, ammoniates, and liquid complex fertilizers. Attention is given to the metals and alloys, and corrosion resistant and thermal insulating materials. Compressors, pumps, and high pressure vessels are treated. Heat and electrical engineering in the plant are considered. Basic information on accident prevention in the nitrogen industry is provided in the form of tables. A.R.H.

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N82-27992# Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Electrical Engineering.
PROCESSING OF ENCRYPTED COMMERCIAL DATA
Benjamin Arazi Pretoria National Research Inst. for Mathematical Sciences Sep. 1981 14 p refs
(CSIR-TWISK-225) Avail: NTIS HC A02/MF A01

A simple encryption scheme is suggested for processing encrypted commercial data stored in the memory of a central computer offering a time sharing service. The validity of the scheme is deduced from certain basic characteristics of commercial data processing. Maintenance of the security of commercial information is made possible. J.D.

N82-27993# National Physical Research Lab., Pretoria (South Africa). Div. of Optical Sciences.
A SYSTEM FOR THE PRELIMINARY PROCESSING OF NOAA POLAR ORBITER DATA WITH LEVEL 1b, LOCAL AREA COVERAGE (LAC) FORMAT
M. Lasserre Jun. 1981 47 p refs
(CSIR-SR-FIS-255) Avail: NTIS HC A03/MF A01

A system of programs to translate and rewrite, in 8 bit accuracy, the 10 bit NOAA LAC TIROS satellite data tapes is presented. Three assembler programs are used to give data quality statistics, 10 bit pixel value histograms, and Earth location, calibration and zenith angle files. A fourth program interfaces with a user defined FORTRAN subroutine for calibration processing directly from 10 bit pixel data. Author

N82-27994# South African Inst. of Civil Engineers, Pretoria.
SYMPOSIUM ON COMPUTERS IN CIVIL ENGINEERING
1981 203 p refs Symp. held in Pretoria, 1981 Sponsored in part by the Construction Industry Computer Information Centre
(ISBN-0-7988-2097-9) Avail: NTIS HC A10/MF A01

Electronic computation in planning, management, and process control is discussed. Trends in computing are considered. Quality control in software is reviewed. Management of inhouse computer facilities is discussed. Graphics software is considered. A drafting system for highway plans is presented. Topographic reference surfaces are examined. Transportation systems modelling is considered. Transportation packages are reviewed. Computer methods in highway engineering are discussed. A two-dimensional finite difference hydraulic model is applied to tidal circulation and harbor resonance. The effects of disruption in contract adminstration are assessed. Computer detailing of concrete reinforcement is discussed. N.W.

N82-27995# California Univ., Berkeley. Electronics Research Lab.
EQUIPMENT FOR RESEARCH IN DATABASE MANAGEMENT AND RESEARCH IN DATA BASE MANAGEMENT Final Report, 25 Sep. 1979 - 24 Sep. 1981
M. R. Stonebraker and E. Wong Jan. 1982 6 p refs
(Contract DAAG29-79-C-0182)
(AD-A112811; ARO-16463.4-A-EL) Avail: NTIS
HC A02/MF A01 CSCL 09/2

Research in three areas of distributed database systems is reported. These are: implementation of distributed INGRES, distributed query processing, distributed crash recovery.
Author (GRA)

N82-27996# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
ON A HIGH-PERFORMANCE VLSI SOLUTION TO DATA BASE PROBLEMS Ph.D. Thesis. Interim Report
Siang Wun Song Aug. 1981 172 p refs
(Contracts N00014-76-C-0370; N00014-80-C-0236; F33615-78-C-1551; Grant NSF MCS-78-23676; NR Proj. 048-659; NR Proj. 044-422)
(AD-A112542; CMU-CS-81-142) Avail: NTIS
HC A08/MF A01 CSCL 09/2

This thesis explores the design and use of custom-made VLSI hardware in the area of database problems. Our effort differs from most previous ones in that we search for structures and algorithms, directly implementable on silicon, for the solution of computation-intensive database problems. The types of target database systems include the general database management

systems and the design database systems. The thesis deals mainly with database systems of the relational model. One common view concerning special-purpose hardware usage is that it performs a specific task. The proposed device is not a hardware solution to a specific problem, but provides a number of useful data structures and basic operations. It can be used to improve the performance of any sequential algorithm which makes extensive use of such data structures and basic operations. The design is based on a few basic cells, interconnected together in the form of a complete binary tree. The proposed device can handle all the basic relational operations: select, join, project, union, and intersection. With a special-purpose device of limited size attached to a host, the overall performance may ultimately be dictated by the I/O between the two sites. The ideal special-purpose device design is one that achieves a balance between computation and I/O. We propose a model to study the I/O complexity for sorting n numbers with any special-purpose hardware device of size s, and show a lower bound result of omega (n log n/log s). We present an optimal design achieving this bound. An important finding is that for practical ranges on the quantity of data to be sorted, systolic sorting devices of small sizes can beat fast sequential sorting algorithms. GRA

N82-27997# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

ANALYSIS AND MODELLING OF TRANSIENT ERRORS IN DIGITAL COMPUTERS Ph.D. Thesis. Interim Report

Stephen Roy McConnel Jun. 1981 138 p refs

(NR Proj. 048-645)

(AD-A112541; CMU-CS-81-132) Avail: NTIS HC A07/MF A01 CSCL 09/2

Experimental data on transient errors from several digital computer systems is presented and analyzed. This is the first scale public study on the statistical distribution of transient errors. The systems for which data has been collected are the DEC PDP-10 series computers, the Cm multiprocessor, and the C.vmp tolerant microprocessor. Statistical tests indicate that transient errors follow a decreasing hazard rate distribution. This is at variance with the standard assumption of constant hazard rates (exponential distribution) used in reliability modeling, and requires models of greater complexity for accurate results. Models of common fault tolerant redundant structures are developed using the Weibull distribution, which has a time-varying hazard rate. Both analytical and simulation models are used to analyze the differences between the reliabilities predicted by Weibull based transient error models and those predicted by exponential based models. The analysis indicates a significant difference between the models based on the exponential distribution and those based on the decreasing hazard rate Weibull distribution. Reliability differences ranging from -0.10 to +0.20 and factors greater than 2.0 in Mission Time Improvement for Weibull parameters equivalent to measured system behavior are seen in the model results. System designers should be aware of these differences. Author (GRA)

N82-27998# Stanford Univ., Calif. Dept. of Computer Science.

THE EPISTEMOLOGY OF A RULE-BASED EXPERT SYSTEM: A FRAMEWORK FOR EXPLANATION

William John Clancey Jan. 1982 74 p refs

(Contract N00014-79-C-0302)

(AD-A112672; SU-STAN-CS-81-896; HPP-81-17) Avail: NTIS HC A04/MF A01 CSCL 09/2

Production rules are a popular representation for encoding heuristic knowledge in programs for scientific and medical problem solving. However, experience with one of these programs, MYCIN, indicates that the representation has serious limitations: people other than the original rule authors find it difficult to modify the rule set, and the rules are unsuitable for use in other settings, such as for application to teaching. These problems are rooted in fundamental limitations in MYCIN's original rule representation: the view that expert knowledge can be encoded as a uniform, weakly-structured set of if/then associations is found to be wanting. Author (GRA)

N82-27999# LinCom Corp., Pasadena, Calif.

BIT SYNCHRONIZATION WITH CROSS SPECTRUM SYCHRONIZATION LOOP. ATTACHMENT 3

R. A. Maag, W. C. Lindsey, C. M. Chie, and C. S. Tsang Oct. 1981 50 p refs

(Contract N00014-81-C-2338)

(AD-A112812) Avail: NTIS HC A03/MF A01 CSCL 09/2

This study seeks to identify the optimal analog technique for implementing a bit synchronizer for wideband data channels; and to compare, in detail, the performance of the analog bit synchronizer with the optimal digital implementation exemplified by the Digital Data Transition Tracking Loop (DTTL) already built and tested. For biphase data, it is shown that the optimal analog implementation based upon the cross-spectrum principle is a delay-and-multiply circuit followed by a conventional CW loop. The optimal delay is about one-quarter of the bit duration. For a 12.5 Mbps data stream, it is roughly 20 ns. The IF filter in front of the delay-and-multiply nonlinearity is immaterial as long as the BT product exceeds three approximately. When compared to the DTTL, the performance of the analog loop is roughly equivalent to a DTTL with a 50% error arm window. It outperforms a full-window DTTL by roughly 3 dB in terms of jitter yet gives inferior acquisition performance. On the other hand, a DTTL with a quarter-window outperforms the analog loop by roughly the same amount. It therefore appears that both the analog and digital bit synchronizer performs equally well. The selection of one over the other must be based on other criteria such as sensitivity to environmental variations, biases, stability and perhaps packaging ease. GRA

N82-28000# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.

ENHANCING TECHNOLOGY TRANSFER OF COMPUTER HARDWARE AND SOFTWARE ARCHITECTURES USING HUMAN FACTORS IN INITIAL DESIGN

Gary K. Poock and Ronald J. Roland Sep. 1981 21 p refs

(AD-A107444; NPS55-81-019) Avail: NTIS HC A02/MF A01 CSCL 09/2

is paper describes an experiment which attempted to subjectively measure the transfer of technology directly from the research arena to operational application. Areas of technology included recently developed computer software 'natural languages' based on artificial intelligence (AI) concepts, computer networking technology and automatic message handling systems. Exposure to this technology was accomplished over a 12 week period where the experimental group was provided with the tools and understanding to use the various research products. Data were collected from this experimental group prior to and after the 12 week period. Analysis of the data revealed interesting aspects concerning a user's perception of the value or utility of computer systems and computer software designed specifically to enhance the human-system interaction. Author (GRA)

N82-28001# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Science.

FEATURE ANALYSIS OF COMPUTER AIDED DESIGN M.S. Thesis

Daniel J. Devescovi Dec. 1981 90 p refs

(AD-A112387) Avail: NTIS HC A05/MF A01 CSCL 09/2

Computers in the architectural and engineering field have been used for many years. Recently, computers have been playing an increasing role in the design process itself through the development of computer aided design systems. The development of interactive computer graphics was a major contributor to the acceptance of the computer in assisting in the design process by the architectural and engineering community. The emphasis is placed on the aspects of computer graphics interactive input devices, the requirement of complete geometric representation of objects and the corresponding data management problem. Computer aided design problems in reference to architectural and engineering design theory is discussed and a brief history of computer aided design with an overview of various systems is presented. Author (GRA)

N82-28002# Harry Diamond Labs., Adelphi, Md.

A NOVEL SCANCONVERTING OSCILLOGRAPHIC TECHNIQUE FOR IN-SITU SIGNAL ACQUISITION WITH SUBSEQUENT AUTOMATIC DIGITIZATION

Jc..athan Vanderwall and Michael Conner Jan. 1982 32 p refs

(DA Proj. 1L6-6262-AH-18; HDL Proj. A18132)

(AD-A113596; HDL-TR-1956) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report discusses the development of a novel equipment for the remote acquisition of oscillographic data in the form of a scan-conversion television signal, its temporary storage by means of an inexpensive video tape recorder, and its subsequent digitization. The essential feature of this equipment is its property of scan conversion: signals captured by a Tektronix R7912 Transient Digitizer are read out not in digital form, but rather as television images of the acquired traces, recorded at the site of the experiment, and returned to the laboratory for subsequent digitization and processing. Author (GRA)

N82-28003# Minnesota Univ., Minneapolis. Dept. of Computer Science.

PREEMPTIVE SCHEDULING OF UNIFORM PROCESSORS WITH MEMORY

Ten-Hwang Lai and Sartaj Sahni Feb. 1982 37 p refs

(Contract N00014-80-C-0650; NR Proj. 049-471)

(AD-A113124; TR-82-5) Avail: NTIS HC A03/MF A01 CSCL 09/2

We consider the problem of preemptively scheduling n jobs on a system of m uniform processors. Each job has a release time, a due time, and a memory requirement associated with it. Each processor has a speed and a memory capacity associated with it. Linear programming formulations are obtained for the following optimization criteria: (1) minimize the schedule length and (2) minimize the maximum lateness. We also consider three special cases with the former optimization criteria. For each of these cases, low order polynomial time algorithms are obtained. Author (GRA)

N82-28004# New Mexico State Univ., Las Cruces. Physical Science Lab.

MAGNETIC BUBBLE MEMORIES FOR DATA COLLECTION IN SOUNDING ROCKETS

Robert L. Wagner, John E. Carr, and Raymond E. Wilton 29 Jan. 1982 45 p refs

(Contract F19628-79-C-0107; AF Proj. 7659)

(AD-A113106; SR-1; AFGL-TR-82-0038) Avail: NTIS HC A03/MF A01 CSCL 09/2

A survey was made to determine the feasibility of using magnetic bubble memories for data storage on board sounding rockets. The advantages and limitations of bubble memories are discussed along with factors influencing their use in sounding rockets. An Intel Magnetics 7110 Bubble Memory was selected as the most likely candidate for sounding rocket applications, and a system concept based on the 7110 is described. Author (GRA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-28005# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

SHALL 4: AN IMPLICIT COMPACT FOURTH-ORDER FORTRAN PROGRAM FOR SOLVING THE SHALLOW-WATER EQUATIONS IN CONSERVATION LAW FORM

I. M. Navon and H. A. Riphagen Aug. 1981 28 p refs

(CSIR-TWISK-227) Avail: NTIS HC A03/MF A01

A FORTRAN 4 computer program is documented implementing a compact fourth order accurate finite difference scheme in a spatially factored form, for solving the nonlinear shallow water equations on a limited domain. In contrast to the usual fourth order schemes this compact fourth order scheme requires the solution of only either block tridiagonal or cyclic block tridiagonal coefficient matrices. Moreover this compact fourth order scheme is related o the finite element method and has a smaller truncation error than the usual fourth order schemes. The integral invariants of the shallow water equations were calculated at each time step and were found to be well conserved during the numerical integration, ensuring that a realistic nonlinear structure is obtained. A Schumann-Wallington low pass filtering procedure was incorporated in the program to overcome the increased aliasing due to the higher accuracy method. A third order boundary condition is imposed, preserving the overall fourth order convergence rate of the interior approximation. Author

N82-28006# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

DOCUMENTATION OF THE COMPUTER PROGRAM CU-3D FOR THE THREE DIMENSIONAL SINGLE CLOUD MODEL

M. K. Yau (McGill Univ.) Sep. 1981 34 p refs

(CSIR-SWISK-26; ISBN-0-798802222-8) Avail: NTIS HC A03/MF A01

The computer program CU-3D is a three dimensional single cloud cumulus model including warm rain and simple ice physics. The various subroutines and the input data used to start the run are described. The equations governing the dynamics and the microphysical processes are also included. Author

N82-28007# McDonnell-Douglas Electronics Co., St. Charles, Mo.

ADVANCED TRAINING TECHNIQUES USING COMPUTER GENERATED IMAGERY Annual Technique Report, 16 May 1980 - 15 Jul. 1981

D. Hauck and D. Soblitz 15 Sep. 1981 74 p refs

(Contract F49620-79-C-0067; AF Proj. 2313)

(AD-A111979; MDC-M3026; AFOSR-82-0160TR) Avail: NTIS HC A04/MF A01 CSCL 05/9

Aircraft simulator systems have been primarily designed as substitutes for actual aircraft. The computer generated imagery of these systems provides the flexibility to enhance training in ways that cannot be done in the real world. The thrust of this research is to conceive and demonstrate training approaches to take advantage of this flexibility as a step towards reducing pilot combat attrition and increasing readiness. Two broad categories of techniques are available to us: (1) synthesizing tasks that are untrainable in aircraft during peacetime but are required during combat; and (2) application of teaching/learning methods unavailable in aircraft. Exploratory testing has begun on numerous techniques. A VITAL IV computer generated image (CGI) system has been used for testing and demonstration. Author (GRA)

N82-28008# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

AUTOMATIC GENERATION OF RELIABILITY FUNCTIONS FOR PROCESSOR-MEMORY-SWITCH STRUCTURES Ph.D. Thesis

Vittal Kini Feb. 1981 284 p

(Contract N00014-77-C-0103; Grant NSF GJ-32758-X; NR Proj. 048-645)

(AD-A112713; CMU-CS-81-121) Avail: NTIS HC A13/MF A01 CSCL 09/2

Reliability computation is gaining much importance for computer system architectures with built in redundancy, such as multiprocessors. The task of computing the reliability function for arbitrary Processor-Memory-Switch (PMS) interconnection structures, however, is tedious and prone to human error. Existing reliability computation programs make one of two assumptions: That the case analysis of success states of the system has been carried out. Such analysis must be done manually. In this instance the input to the program is usually in the form of an intermediate representation (e.g., Fault Tree, Reliability Graph); and That the interconnection structure is a member of, or can be partitioned into, some limited class of structures for which a parametric family of equations exists (e.g., N-Modular Redundant systems, Hybrid Redundant systems). This thesis represents a first step in the development of a methodology for automating the computation of symbolic reliability functions for arbitrary interconnection structures at the PMS level. The work reported here automates the task of case analysis and problem partitioning in the hard-failure reliability computation for PMS structures. As a consequence attention is freed to focus almost wholly on specifying the reliability computation problem. The advantages of such an approach are (i) utility to a larger class of users, not necessarily expert in reliability analysis, and (ii) a lower probability of human error in the computation. GRA

N82-28009# Stanford Univ., Calif. Dept. of Computer Science.
ON PROGRAM TRANSFORMATIONS FOR ABSTRACT DATA TYPES AND CONCURRENCY
P. Pepper Oct. 1981 38 p refs
(Contract N00014-76-C-0687)
(AD-A112492; SU-STAN-CS-81-883) Avail: NTIS HC A03/MF A01 CSCL 09/2

We study transformation rules for a particular class of abstract data types, namely types that are representable by recursive mode declarations. The transformations are tailored to the development of efficient tree traversal and they allow for concurrency. The techniques are exemplified by an implementation of concurrent insertion and deletion in 2-3-trees. Author (GRA)

N82-28010# Stanford Univ., Calif. Dept. of Computer Science.
DEDUCTIVE SYNTHESIS OF THE UNIFICATION ALGORITHM
Zohar Manna and Richard Waldinger Jun. 1981 52 p refs
Submitted for publication Sponsored in part by the Weizmann Inst. of Science
(Contracts N00014-76-C-0687; N00014-75-C-0816; Grants AF-AFOSR-0014-81; NSF MCS-78-02591; NSF MCS-79-09495)
(AD-A107328; SU-STAN-CS-81-855) Avail: NTIS HC A04/MF A01 CSCL 09/2

The deductive approach is a formal program-construction method in which the derivation of a program from a given specification is regarded as a theorem-proving task. To construct a program whose output satisfies the conditions of the specification, we prove a theorem stating the existence of such an output. The proof is restricted to be sufficiently constructive so that a program computing the desired output can be extracted directly from the proof. The program we obtain is applicative and may consist of several mutually recursive procedures. The proof constitutes a demonstration of the correctness of this program. To exhibit the full power of the deductive approach, we apply it to a nontrivial example - the synthesis of a unification algorithm. Unification is the process of finding a common instance of two expressions. Algorithms to perform unification have been central to many theorem-proving systems and some programming language processors. The task of deriving a unification algorithm automatically is beyond the power of existing program-synthesis systems. In this paper, we use the deductive approach to derive an algorithm from a simple, high-level specification of the unification task. We will identify some of the capabilities required of a theorem-proving system to perform this derivation automatically. Author (GRA)

N82-28011# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
RECOVERING INTRINSIC SCENE CHARACTERISTICS FROM IMAGES Interim Technical Report, 28 Sep. 1980 - 27 Sep. 1981
Martin A. Fischler and Andrew P. Witkin Nov. 1981 20 p refs
(Contract DAAG29-79-C-0216; ARPA Order 2894; SRI Proj. 1019)
(AD-A110757; ARO-17127.4-A-EL) Avail: NTIS HC A02/MF A01 CSCL 05/8

The central theme of our research is the recovery of information about the three-dimensional structure and physical characteristics of surfaces depicted in an image - their shapes, locations, and photometric properties. The main obstacle to surface recovery is the confounding of the desired properties in the sensory data: images are inherently ambiguous. Our approach to resolving this ambiguity rests on the application of generic, low-level knowledge (e.g., such basic assumptions as surface continuity and general position) to constrain the interpretation. The problem may be viewed as that of decomposing the image into its physically meaningful constituents - surface orientation, reflectance, illumination, and so on. The 'intrinsic image model' provides a conceptual and computational framework in which this view is made explicit. Surface perception plays a fundamental role in early visual processing, both in humans and in machines. Work on surface perception has focused on the discrimination of edge types (e.g., extremal boundary or cast shadow), on the three dimensional interpretation of edges, and on surface reconstruction by interpolating from edges and using texture geometry. Author (GRA)

N82-28012# VERAC, Inc., San Diego, Calif.
IMAGE COMPRESSION RESEARCH Final Technical Report, May 1980 - Jun. 1981
Michael S. Murphy Griffiss AFB, N.Y. RADC Aug. 1981 188 p refs
(Contract F30602-80-C-0168; AF Proj. 4594)
(AD-A110811; R-021-81; RADC-TR-81-223) Avail: NTIS HC A09/MF A01 CSCL 05/8

The vast quantities and high generation rates of tactical imagery require very efficient data compression in order to conserve precious bandwidth for transmission and to limit the required storage volume for archiving. This report describes the results of efficiency and image quality comparisons for several transform image coding techniques. Research effort focused on developing the Singular Valve Decomposition (SVD) as an approach to image compression. Detailed comparisons were to the two dimensional cosine transform, Hadamard transform and Karhunen-Loeve techniques. High and low altitude aerial imagery, and IR and SAR imagery were included. Images were coded with rates in the range .25 to 1.5 bits per pixel (bpp). (Original images were digitized at 8 bpp.) The order of performance, as measured by rms error (reconstructed image versus original) versus bpp, as well as by visual image quality judgements, was first, cosine and Karahunen-Loeve (nearly the same), second, SVD, and third, Hadamard. Computational burdens, however, are least for the Hadamard, intermediate for cosine and Karhunen-Loeve and most for the SVD technique. GRA

N82-28013# Mitre Corp., Bedford, Mass.
USER'S MANUAL FOR THE AFSATCOM TERMINAL UPGRADES LIFE CYCLE COST MODEL, VOLUME 1
W. H. Browning and D. B. Peters Hanscom AFB, Mass. Electronic Systems Div. Oct. 1981 336 p 2 Vol.
(Contract F19628-81-C-0001; AF Proj. 6340)
(AD-A110962; MTR-8318-Vol-1; ESD-TR-81-146-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 09/2

A computerized Life Cycle Cost (LCC) Model has been adapted for the AFSATCOM Terminal Upgrades (ATU) Program from the Strategic Satellite System LCC Model. The ATU LCC Model is tailored for this program in its structuring of terminal equipment and in the particular trade-off analyses which it supports. The Model emphasizes system support costs and design related cost drivers such as reliability and installation. A capability to study the cost trade-offs between fault isolation using built-in test equipment and using peculiar support equipment is included. The Model also considers three-level maintenance philosophies which include centralized intermediate maintenance facilities. GRA

N82-28014# Mitre Corp., Bedford, Mass.
USER'S MANUAL FOR THE AFSATCOM TERMINAL UPGRADES LIFE CYCLE COST MODEL. VOLUME 2: APPENDIX D. PREPROCESSOR FORTRAN SOURCE CODE: APPENDIX E. LCC PROGRAM FORTRAN SOURCE CODE: APPENDIX F. RLA PROGRAM
W. H. Browning and D. B. Peters Hanscom AFB, Mass. Electronic Systems Div. Oct. 1981 340 p 2 Vol.
(Contract F19628-81-C-0001; AF Proj. 6940)
(AD-A110964; MTR-8318-Vol-2; ESD-TR-81-146-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 09/2

This volume of the User's Manual for the AFSATCOM Terminal Upgrades Life Cycle Cost Model contains listings of the FORTRAN source code for the three programs comprising the Model. These three programs are the Preprocessor, the LCC Program, and the RLA Program. Author (GRA)

N82-28015# RAND Corp., Santa Monica, Calif.
RATIONALE AND MOTIVATION FOR ROSIE
F. Hayes-Roth, O. Gorlin, S. Rosenschein, H. Sowizral, and D. Waterman Nov. 1981 95 p
(Contract MDA903-78-C-0029)
(AD-A111018; RAND/N-1648-ARPA) Avail: NTIS HC A05/MF A01 CSCL 09/2

ROSIE (Rule-Oriented System for Implementing Expertise)

is a programming language and programming system for artificial intelligence (AI) applications. The ROSIE language is a stylized version of English. The primary design goal for the language was to achieve exceptional program readability; a second goal was to support the development of significant applications. ROSIE allows the programmer to describe complex relationships simply and to manipulate them symbolically and deductively. In addition, it supports network communications and patterned reading and writing to other systems. It also provides for interactive, compiled, and interpreted computing, with a variety of debugging and programming tools. ROSIE encompasses many of the capabilities of conventional programming languages. It is a general-purpose language offering a variety of typical data types and control constructs found in most high-level languages, together with a few found only in AI languages. Among the features included are: rulesets that generate sets, predicates that test propositions, propositional data types, and some limited forms of deduction. Using ROSIE, an AI programmer can think concretely about the problem domain and translate ideas into a program using substantially the same vocabulary that arises in the English (non-computational) formulation of the model. GRA

N82-28016# Honeywell Systems and Research Center, Minneapolis, Minn. Operations Training Div.
COMPUTER IMAGE GENERATION: ADVANCED VISUAL/SENSOR SIMULATION Final Report
David Serreyn and David Duncan Brooks AFB, Texas AFHRL Oct. 1981 51 p refs
(Contract F33615-80-C-0006; AF Proj. 6114)
(AD-A107098; AFHRL-TP-81-23) Avail: NTIS HC A04/MF A01 CSCL 14/5

This study investigated, developed, and evaluated various Computer Image Generation (CIG) techniques to overcome the qualitative limitations of current CIG imaginery produced by edge-based systems. The study concluded with an integration of techniques into a system concept. This report describes the techniques investigated, the system concept developed, and the general hardware implementations which are useful for cost/benefit tradeoffs. The system concept presented is based on the use of textured terrain for realistic simulation. In areas where the technique was for training effectiveness and an algorithmically unified system. The approach also involves the display of terrain as curved surfaces represented by bicubic splines. Author (GRA)

N82-28017# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
SOFTWARE TECHNOLOGY TRANSFER AND EXPORT CONTROL Report, Dec. 1979 - Oct. 1980
Seymour E. Goodman (Virginia Univ.), Norman S. Glick, William K. McHenry (Virginia Univ.), John B. McLean (RADC), Claude E. Walston (IBM), and Clark Weissman (System Development Corp.) Jan. 1981 142 p refs
(Contract MDA903-79-C-0018)
(AD-A106869; AD-E500419; IDA-N-878; IDA/HQ-81-23408) Avail: NTIS HC A07/MF A01 CSCL 09/2

The formulation of a reasonable and effective export control policy for software products and software engineering know-how has been an important and difficult task for both the U.S. Government and industry. This note represents the contribution of the Software Subgroup of Technical Working Group 7 (Computers) to the development of a technical policy for the control of software. The note attempts to provide useful discussions and analysis in three areas. The first examines why the problem of software control has been so difficult, and presents the rationale for a number of working hypotheses which underlie the approach taken for the entire study. The second examines, in some detail, the 'what' (know-how and operational capability) and 'how' (transfer mechanisms) of software technology transfer. The last section recommends several items for inclusion on the Militarily Critical Technologies List. GRA

N82-28018# Naval Postgraduate School, Monterey, Calif.
THE AUTOMATIC GENERATION OF SYNTAX DIRECTED EDITORS
Bruce J. MacLennan Oct. 1981 48 p refs
(RR0000110)
(AD-A107078; NPS52-81-014) Avail: NTIS HC A03/MF A01 CSCL 09/2

A syntax directed editor is an editor oriented towards a particular language. This paper describes a general table-driven syntax directed editor and an algorithm for automatically generating a syntax directed editor for a language from a description of that language. Aside from the convenience of a syntax directed editor, it is also a very efficient parser. No syntactic error recovery is required since the editor does not permit the user to make syntactic errors. Some of the implications of syntax directed editors for data structure manipulation and two dimensional languages are briefly discussed. Author (GRA)

N82-28019# Naval Postgraduate School, Monterey, Calif.
ADPE ACQUISITION: THE ACQUISITION OF THE NAVAL POSTGRADUATE SCHOOL COMPUTER: A CASE STUDY M.S. Thesis
John Earl Boyle Sep. 1981 48 p refs
(AD-A107478) Avail: NTIS HC A03/MF A01 CSCL 05/3

The federal computer acquisition process is examined by studying one particular major computer system acquisition. The manner in which the principals involved conducted the acquisition in relation to the political and regulatory environment is examined and displayed in a case study format. Although the situational facts involve a computer acquisition for the Naval Postgraduate School, broad issues are developed which apply universally to public and private sector computer systems acquisition. The case exposes the reader to the issues of specification development, conversion costs, benchmark testing, and the role of competition in computer acquisition. Attention is focused on the environment in which a computer system need is developed and how that need is 'marketed' through the review and support process of a large organizational buying system. GRA

N82-28020# Naval Postgraduate School, Monterey, Calif.
DYNAMIC PLANNING AND CONTROL OF SOFTWARE MAINTENANCE: A FISCAL APPROACH M.S. Thesis
James F. Green and Brenda F. Shelby Dec. 1981 129 p refs
(AD-A112801) Avail: NTIS HC A07/MF A01 CSCL 14/1

Until recently, much of the budget planning for software systems has been primarily targeted at costs incurred during the development phase. However, with increasing software system life span and complexity, maintenance costs have become a more prevalent concern. As a result of necessary corrections for design errors and evolutionary maintenance, post-delivery investment in software systems now requires a greater proportional share of the life-cycle costs. In this research, various methodologies and system factors relating to software cost accounting are reviewed with the intent of developing a cost control model for arriving at a well-structured view for the management of the maintenance phase of the software life-cycle. The model proposed embodies a planning concept for establishing a maintenance strategy and a control concept for analyzing manloading requirements during the maintenance phase.
Author (GRA)

N82-28021# Naval Research Lab., Washington, D. C.
A FORTRAN IV PLOT ROUTINE WITH HIDDEN LINE SUPPRESSION FOR USE WITH SMALL COMPUTER SYSTEMS Final Report
H. Paris Coleman 26 Mar. 1982 15 p refs
(RR0210543)
(AD-A112417; NRL-MR-4776) Avail: NTIS HC A02/MF A01 CSCL 09/2

A routine useful for plotting projections of surfaces representing a dependent variable as a function of two independent variables is described. This routine implements hidden line suppression. Simplification, to allow implementation on small computers, is emphasized. A FORTRAN IV listing of the routine is included. Author (GRA)

N82-28022# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
EVALUATION OF DISTRIBUTION AND DISPLAY SYSTEM FOR SATELLITE IMAGERY, PHASE 1 Interim Report, Sep. - Oct. 1980
John Henline and James Talotta Mar. 1982 23 p
(FAA Proj. 131-401-806)
(AD-A113619; FAA-RD-82-2; FAA-CT-81-45) Avail: NTIS

HC A02/MF A01 CSCL 09/2

This in-house study was conducted to determine the acceptability and operational effectiveness of an experimental system for displaying and distributing satellite imagery designed for flight service station (FSS) application. Primarily, consideration was given to the efficacy of the displayed data, together with the presentation format used for the demonstration. Secondly, man-machine relationship and some software aspects were tested and evaluated. Interim results indicate that the prototype system provided graphic data in a form suitable for use by preflight, in-flight, and en route flight advisory specialists for nearly all their briefing functions. Equipment configuration, assembled for this evaluation/demonstration, proved reliable and acceptable (though not necessarily optimal) by the specialists participating in the demonstration. Conditional acceptability included display medium and size, graphical quality and information presentation, and associated software programs for accessing the data through the prototype system. It is recommended that a field study be conducted as Phase II of this evaluation. Author (GRA)

N82-28023# RAND Corp., Santa Monica, Calif.
PROGRAMMING IN ROSIE: AN INTRODUCTION BY MEANS OF EXAMPLES
J. Fain, F. Hayes-Roth, H. Sowizral, and D. Waterman Feb. 1982 94 p refs
(Contract MDA903-78-C-0029; ARPA Order 3460)
(AD-A114044; RAND/N-1646-ARPA) Avail: NTIS
HC A05/MF A01 CSCL 09/2

ROSIE is a programming system designed to support the development of expert systems and other heuristic programming applications. ROSIE offers great promise because it combines many modern capabilities within a single system, including English as a programming language; knowledge representation capabilities; a built-in relational database system; flexible string matching and communication capabilities; highly modular programming structures; a file package and interactive programming environment. This Note presents a number of examples of ROSIE programs in such diverse areas as legal decisionmaking, war gaming, and detecting hazardous chemical spills. The Note should be useful to readers who intend to program in ROSIE.
Author (GRA)

N82-28024# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
THE USE OF DATABASE TECHNIQUES IN THE IMPLEMENTATION OF A SYNTACTIC PATTERN RECOGNITION TASK ON A PARALLEL RECONFIGURABLE MACHINE M.S. Thesis
Elizabeth Cathro Seed and Howard Jay Siegel Dec. 1981 110 p refs
(Grant AF-AFOSR-3581-78)
(AD-A113934; TR-EE-81-49; AFOSR-82-0301TR) Avail: NTIS
HC A06/MF A01 CSCL 05/8

Use of syntactic pattern recognition has been shown to be an effective technique for picture processing; it is, however, computationally time-consuming. The way in which a paralled SIMD/MIMD machine, PASM, can be used to decrease the processing time of these tasks is examined. Paralled machines have been used predominantly for decreasing the processing time of numerical problems in which the data is frequently well-ordered. In contrast, a syntactic pattern recognition task would use a parallel machine to perform multiple search, comparison, and string manipulator operations on some relatively complex data structures. A solution to the problem of implementing a specific parallel syntactic pattern recognition task, a parallel tree automaton, through the use of a relational database and relational language is proposed. Use of a CODASYL database and database language is also investigated. Two algorithms for implementing the parallel tree automaton are described. The problem of obtaining a reasonable processor and data allocation scheme for the two algorithms and for the two relational programs derived from the two algorithms is discussed. A comparison of the different problems posed by each algorithm is made. GRA

N82-28025# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF PARNAS' it-ti CONSTRUCT IN LISP
A. Dain Samples Mar. 1982 22 p
(RR0000110)
(AD-A113743; NPS52-82-005) Avail: NTIS
HC A02/MF A01 CSCL 09/2

D.L. Parnas has recently proposed: a new programming control structure the it-ti. This construct is a synthesis of several ideas in programming theory including iteration, conditionals, and Dijkstra's guards. It has been implemented in a LISP interpreter (8) as a more structured replacement for the traditional prog construct. Several programming examples are given that compare the use of the it-ti with the more conventional programming constructs. These examples will also show that the it-ti fails to satisfy several criteria for programming constructs including manageability and visibility. An appendix to this report contains an extension of Dijkstra's concept of the weakest precondition to the it-ti. Author (GRA)

N82-28026# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
A COMPATIBLE HARDWARE/SOFTWARE RELIABILITY PREDICTION MODEL Ph.D. Thesis. Final Report
Xavier Castillo and Thomas D. Smith 22 Jul. 1981 159 p refs
(Contract DASG60-80-C-0057)
(AD-A113590; CMU-CS-81-138) Avail: NTIS
HC A08/MF A01 CSCL 09/2

In this paper a new modeling methodology to characterize failure processes in Time-Sharing systems due to hardware transients and software errors is presented. The basic assumption made is that the instantaneous failure rate of a system resource can be approximated by a deterministic function of time plus a zero-mean stationary Gaussian process, both depending on the usage of the resource considered. The probability density function of the time to failure obtained under this assumption has a decreasing hazard function, partially explaining why other decreasing hazard function densities such as the Weibull fit experimental data so well. Furthermore, by considering the Operating System kernel as a system resource, this methodology sets the basis for independent methods of evaluating the contribution of software and hardware to system unreliability. The modeling methodology has been validated with the analysis of a real system. The predicted system behavior according to this methodology is compared with the predictions of other models such as the exponential, Weibull, and periodic failure rate. The implications of this methodology are discussed and some applications are given in the areas of Performance/Reliability modeling, software reliability evaluation, models incorporating permanent hardware faults, policy optimization, and design optimization. Author (GRA)

N82-28027# Stanford Univ., Calif. Dept. of Computer Science.
WELL STRUCTURED PARALLEL PROGRAMS ARE NOT EASIER TO SCHEDULE
Ernst W. Mayr Sep. 1981 18 p refs
(Contract N00014-81-K-0269; Grant NSF IST-79-21977)
(AD-A113400; SU-STAN-CS-81-880) Avail: NTIS
HC A02/MF A01 CSCL 09/2

The scheduling problem for unit time task systems with arbitrary precedence constraints is known to be NP-complete. We show that the same is true even if the precedence constraints are restricted to certain subclasses which make the corresponding parallel programs more structured. Among these classes are those derived from hierarchic cobegin-coend programming constructs, level graph forests, and the parallel or serial composition of an out-tree and an in-tree. In each case, the completeness proof depends heavily on the number of processors being part of the problem instances. Author (GRA)

N82-28028# Washington Univ., Seattle. Dept. of Mathematics.
OPTIMIZATION PROBLEMS: DUALITY AND MULTIPLIER METHODS Final Technical Report
R. T. Rockafellar 19 Feb. 1982 22 p refs
(Grant AF-AFOSR-3204-77; AF Proj. 2304)
(AD-A113075; AFOSR-82-0259TR) Avail: NTIS
HC A02/MF A01 CSCL 12/1

Research under this grant during the period 1977-1981 resulted in 20 technical articles, two books and a Ph.D. thesis.

The work is summarized under the following headings: (1) nonlinear programming algorithms, (2) multistage stochastic optimization, (3) networks and monotropic programming, (4) sub-gradient analysis and nonsmooth optimization, (5) marginal values and sensitivity analysis, (6) genericity of optimality conditions, (7) optimal control of dynamical systems. Author (GRA)

N82-28029# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

A LOCAL FRONT END FOR REMOTE EDITING

Richard M. Stallman 25 Feb. 1982 27 p refs

(Contract N00014-80-C-0505)

(AD-A113496; AI-M-643) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Local Editing Protocol allows a local programmable terminal to execute the most common editing commands on behalf of an extensible text editor on a remote system, thus greatly improving speed of response without reducing flexibility. The Line Saving Protocol allows the local system to save text which is not displayed, and display it again later when it is needed, under the control of the remote editor. Both protocols are substantially system and editor independent. Author (GRA)

N82-28030# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

SEEING WHAT YOUR PROGRAMS ARE DOING

Henry Lieberman Feb. 1982 41 p refs

(Contracts N00014-75-C-0522; N00014-80-C-0505)

(AD-A113494; AI-M-656) Avail: NTIS HC A03/MF A01 CSCL 09/2

An important skill in programming is being able to visualize the operation of procedures, both for constructing programs and degugging them. TINKER is a programming environment for LISP that enables the programmer to 'see what the program is doing' while the program is being constructed, by displaying the result of each step in the program on representative examples. To help the reader visualize the operation of Tinker itself. Author (GRA)

N82-28031# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.

NAVLISP REFERENCE MANUAL

A. Dain Samples Mar. 1982 35 p

(RR0000110)

(AD-A113744; NPS52-82-004) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Naval Postgraduate School's Computer Laboratory has developed a dialect of LISP, called Navlisp, to run under PWB/UNIX on a PDP11/50. This manual is not a tutorial to LISP. It is intended for those who know the basics of the LISP programming language and wish to use the Navlisp dialect. Author (GRA)

N82-28032# Mitre Corp., Bedford, Mass.

AISIM EVALUATION: PRELIMINARY REPORT

Herman P. Schultz, Subramaniam Natarajan, and Jeffrey K. Fryer Hanscom AFB, Mass. ESD Mar. 1982 140 p

(Contract F19628-81-C-0001; AF Proj. 5220)

(AD-A113108; MTR-8518; ESD-TR-82-119) Avail: NTIS HC A07/MF A01 CSCL 17/2

The current focus of Project 522C is on the evaluation of an interactive simulation modeling system called AISIM (Automated Interactive Simulation Modeling). The purpose of this system is to assist systems engineers to perform conceptual phase systems engineering activities and analyses. A major AISIM evaluation activity was a hands-on test of AISIM conducted at the developer's facility. Five benchmark problems were used for these tests. This report presents a preliminary evaluation of AISIM based on the results of those tests. The tests showed that AISIM was easy to learn and use and produced accurate results for the models developed. Further, it is recommended that AISIM be used on a trial basis for some acquisition projects. GRA

N82-28033# Indiana Univ., Bloomington. Dept. of Chemistry.

A NEW, DIRECTLY COMPUTER-CONTROLLED pH STAT

Ralph E. Lemke and Gary M. Hieftje 8 Mar. 1982 40 p refs

(Contract N00014-76-C-0838)

(AD-A112878; TR-43; TR-51) Avail: NTIS HC A03/MF A01 CSCL 09/2

The design and implementation of a computer-controlled pH-stat is presented. The titrant delivery system used in the design of the pH-stat is based on a computer-controlled droplet generator able to selectively add titrant aliquots of 0.06 micron L. Precise titrant control enables the stationary control of pH to within 0.0008 pH units. Algorithms for program operation are structured as autonomous concurrent tasks and are written entirely in FORTRAN. Author (GRA)

N82-28034# Maryland Univ., College Park. Computer Science Center.

AN INVESTIGATION OF FUNCTIONAL CORRECTNESS ISSUES Ph.D. Thesis

Douglas D. Dunlop 1982 103 p refs

(Contract F49620-80-C-0001; AF Proj. 2304)

(AD-A113040; CSC-TR-1135; AFOSR-82-0263TR) Avail: NTIS HC A07/MF A01 CSCL 09/2

Given a program and an abstract functional specification that the program is intended to satisfy, a fundamental question is whether the program executes in accordance with (i.e., is correct with respect to) the specification. A simple functional correctness technique is initially defined which is based on prime program decomposition of composite programs. This technique is analyzed and the problems of the need for each intended loop function and the inflexibility of the prime program decomposition strategy are discussed. The notion of a reduction hypothesis is then defined which can be used in the place of an intended loop function in the verification process. Furthermore, an efficient proof decomposition strategy for composite programs is suggested which is based on a sequence of proof transformations. Author (GRA)

N82-28035# Bendix Corp., Kansas City, Mo.

MLREG, STEPWISE MULTIPLE LINEAR REGRESSION PROGRAM

J. H. Carder Sep. 1981 55 p refs

(Contract DE-AC04-76DP-00613)

(DE82-000824; BDX-613-2690) Avail: NTIS HC A04/MF A01

A multiple linear regression according to a stepwise procedure written in FORTRAN is discussed. The program transforms and combines old variables into new variables, prints input and transformed data, sums, raw sums or squares, residual sum of squares, means and standard deviations, correlation coefficients, regression results at each step, ANOVA at each step, and predicted response results at each step. This package contains an EXEC used to execute the program, sample input data and output listing, source listing, documentation, and card decks containing the EXEC sample input, and FORTRAN source. DOE

N82-28036# California Univ., Livermore. Lawrence Livermore Lab.

PROGRAMMING IN PRAXIS: A DETAILED INTRODUCTION AND TUTORIAL FOR THE PRAXIS LANGUAGE

J. R. Greenwood, W. I. Nowicki (Stanford Univ.), A. Evans, Jr. (Bolt, Beranek and Newman, Inc.), C. R. Morgan (Wisconsin Univ., Madison), and M. C. Zarnstorff 14 Jul. 1981 259 p refs

(Contract W-7405-eng-48)

(DE82-002523; UCID-18995) Avail: NTIS HC A12/MF A01

This document is a detailed introduction and tutorial for the PRAXIS language. It is meant to serve as an introductory manual for someone who already knows how to program but may not have used a structured language, as well as a reference manual during normal use. Each chapter of the manual discusses a specific aspect of the language, using descriptions of semantic and syntax as well as numerous examples. DOE

N82-28037# California Univ., Livermore. Lawrence Livermore Lab.

TRACAN: A COMPUTER PROGRAM TO ACQUIRE AND ANALYZE DATA CAPTURED BY A TRANSIENT RECORDER. USER'S MANUAL

C. Kalina Wong 2 Dec. 1981 61 p

(Contract W-7405-eng-48)

(DE82-004740; UCID-19249) Avail: NTIS HC A04/MF A01

The TRACAN (Transient Recorder to ACquire and ANalyze data) is a FORTRAN computer program which allows the user to check the settings of the transient recorder, arms the transient recorder, stores the captured data onto a selected disk, lists the names of the files containing the data that have been stored, reads the data stored on disk and plots the data. The program can be menu driven (user selects the task) or it can be used in a sequential fashion with the program prompting the user for the next course of action. DOE

N82-28038# Salford Univ. (England).

SIMULATION STUDIES WITH MODERN COMPUTER STRUCTURES Final Report

R. E. Crosbie, J. L. Hay, S. Javey, M. D. Narotam, and J. B. Slater Paris ESA Oct. 1981 68 p refs

(Contracts ESA-4155/79/NL-PP(SC); RE-L1-83)

(ESA-CR(P)-1546) Avail: NTIS HC A04/MF A01

The potential of recent advances in computer structures for improving the cost effectiveness of simulation activities was investigated. The feasibility of implementing simulation software on these advanced systems, while maintaining user friendliness and computational economy both, was studied. Only systems that have an at least partly proven design were considered. Results emphasize the necessary modifications to conventional approaches to computerized simulation which are required in order to ensure that effective use is made of the chosen computer architecture. The numerical techniques and algorithms as well as the more general software environment of continuous-systems simulation are described. Author (ESA)

N82-28039# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

COMPARISON OF RECURRENCE FORMULAS AND THE LENTZ ALGORITHM FOR THE COMPUTATION OF SPHERICAL BESSEL FUNCTIONS IN MIE SCATTERING APPLICATIONS

M. Timmerman (Royal Military Academy, Brussels) May 1981 34 p refs

(VKI-TM-31) Avail: NTIS HC A03/MF A01

Computer programs which evaluate spherical Bessel functions of the first and second kind are presented. The computation is done in two ways: with recurrence formulas and with the Lentz algorithm. The results and tabulated values are compared. For values of N smaller than the integer part of the argument, the recurrence formulas do very well. A general scheme is proposed for this case that makes use of both the reccurence formulas and Lentz algorithm. For values of N greater than the integer part of the argument, single precision routines can do the job satisfactorily. Author (ESA)

N82-28040# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

MULTI, ARITFU AND ANALFU: PROCEDURES WRITTEN IN ALGOL-SIMULA FOR MULTIPLE PRECISION ARITHMETIC AND SOME NUMBER THEORETIC COMPUTATIONS

Hans Riesel 1982 54 p refs

(TRITA-NA-8202) Avail: NTIS HC A04/MF A01

Programs and ALGOL procedures for the DEC-10 and DEC-20 computers are described. The package is to support research in certain areas of number theory, such as index computations, primality tests, factorization and some analytic work. Three SIMULA external classes are listed: multiple precision integer arithmetic (MULTI), arithmetical functions (ARITFU), and analytic functions (ANALFU). The class MULTI contains, apart from procedures for the four basic arithmetic operations, procedures for input/output operations, operations for rational arithmetic, the square root, and so on for large integers. The class ARITFU contains the most common arithmetical functions, mainly those which depend on the factorization of the argument n. They all have an integer as argument and the result is also one or more integers. The procedures in the class ANALFU were conceived in order to solve a specific problem: the evaluation of certain sums and products taken over all primes. Programming examples and the program code for each of the three classes are given. Author (ESA)

N82-28041# Sheffield Univ. (England). Dept. of Control Engineering.

TEACHING PROGRAMMING TO ENGINEERS: THE CHOICE OF LANGUAGE

A. S. Morris 1981 12 p refs

(RR-168) Avail: NTIS HC A02/MF A01

The merits of the major languages presently available for teaching computer programming to engineering students are examined. The ultimate application of programming by engineers is given prominence. This evaluation fills a gap in the information presently available to planners of engineering courses. Recommendations about the best language are made from engineering considerations and offer an alternative to the much less application-orientated criteria typically adopted by university computer science departments. Author (ESA)

N82-28042# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.

AN INTERACTIVE BRANCH-AND-BOUND ALGORITHM FOR MULTIPLE CRITERIA OPTIMIZATION

Odile Marcotte and Richard M. Soland 31 May 1981 61 p refs

(Grant NSF ECS-79-11909)

(PB82-153578; SER-T-442) Avail: NTIS HC A04/MF A01 CSCL 05A

An interactive algorithm for multiple criteria optimization is presented. The algorithm is of the branch-and-bound type, and differs from previous interactive algorithms in several ways. First; the field of application of the algorithm is wider because it applies to two important classes of multiple criteria decision problems: those for which the feasible set is convex and those for which the feasible set is discrete. Secondly, the algorithm does not require a great deal from the decision maker. The algorithm and its variations and some simulation experiments performed with the algorithm are described. GRA

N82-28043# Cincinnati Univ., Ohio. Dept. of Mechanical and Industrial Engineering.

USER'S MANUAL FOR UCIN-INERTIA: A COMPUTER PROGRAM FOR COMPUTING INERTIA PROPERTIES OF ARBITRARILY SHAPED ROBOT LINKS

Frederick A. Kelly and Ronald L. Huston Oct. 1981 52 p refs

(Grant NSF MEA-81-01110)

(PB82-147885; NSF/MEA-81011) Avail: NTIS HC A04/MF A01 CSCL 06D

A user's manual is presented for the computer program UCIN-INERTIA, which is an easy to use, automatic, and efficient tool for computing the inertia properties of arbitrarily shaped robot or manipulator links. An overview of the program is included and its capabilities and limitations are noted. The geometrical properties of the fundamental element shapes used in forming the robot links are described. An example run is given along with specific input data and the output record. The computer code, written in FORTRAN IV, contains 1,510 lines of source. A 39 K core is required with a typical run time of one-fourth of a second. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N82-28044# Transportation Systems Center, Cambridge, Mass.

AN ANALYSIS OF SELECTED ENHANCEMENTS TO THE EN ROUTE CENTRAL COMPUTING COMPLEX Final Report, May - Sep. 1981

William Broadley, Harvey Freeman, James Oiesen, Ronald Rutledge, and Kenneth Thurber Washington Sep. 1981 105 p refs

(AD-A113575; DOT-TSC-FAA-81-20) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report analyzes selected hardware enhancements that could improve the performance of the 9020 computer systems, which are used to provide en route air traffic control services. These enhancements could be implemented quickly, would be relatively inexpensive, and would provide a solution to the

short-term but not the long-term problems that the system faces. Three memory enhancements are discussed. First, the storage element (SE) memory boxes could be replaced. Second, the memory stacks in the SE's could be replaced. Third, the memory stacks in the input-output control elements (IOCE's) could be replaced. Three processor enhancements are discussed. First, the processors in the compute elements (CE's) could be sped up. Second, the processors in the IOCE's could be sped up. Third, the CE's could be replaced. GRA

N82-28045# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
DATA PROCESSING AND SYSTEM SAFETY
J. L. Deschanels, P. Lavendrine, J. P. Menard (Corsia), and P. Pekar (Corsia) 1981 15 p Presented at 5th System Safety Conf., Denver, 26-31 Jul. 1981
(SNIAS-821-422-108) Avail: NTIS HC A02/MF A01

The vulnerability of different data processing structures to accident or sabatoge as well as computer information security are considered. Characteristics of data processing architectures (centralization; decentralization; site location) and security implications are discussed. The multiplicity of structures possible in automated systems emphasizes the need for security which should be defined by precise objectives and, if possible, quantified. A system safety program that allows for risk analysis is presented. The program, PARI, is composed of 12 modules. Data processing risk is determined by an overall fault tree method. The importance of a systematic approach is stressed. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N82-28046# Washington Univ., Seattle. Dept. of Electrical Engineering.
CONTROL SYSTEMS AND NETWORKS Final Technical Report, 1 Feb. 1978 - 31 Jan. 1982
James S. Meditch Mar. 1982 17 p
(Grant AF-AFOSR-3546-78; AF Proj. 2304)
(AD-A113919; AFOSR-82-0276TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research conducted falls into the two categories of (1) Control Systems and (2) Networks. Within the former category, work was carried out in the areas of vector-delay inverses, pseudoinverses, fixed-lag smoothing, and the design of multivariable control systems using the theories of system inverses. In the category of Networks, research was pursued on the problems of modeling, analysis, optimization, and control of large-scale distributed networks for C3. Specific issues addressed were those of hierarchical control, decomposition, and distributed intelligence in the optimization of network performance, the theory of imbedded Markov chains and the techniques of aggregation for distributed optimal control of C3 networks, modeling and performance analysis of the packet-formation process in packet-switched networks, formulation of a very fast algorithm for approximate solution of the optimal routing problem for message and packet-switched networks, optimal channel capacity assignment in networks subject to end-to-end average message delay constraints, and centralized and distributed algorithms for minimum hop routing subject to average message delay. GRA

N82-28047# Stanford Univ., Calif. Dept. of Computer Science.
THE DEVELOPMENT OF REPRESENTATION METHODS TO FACILITATE KNOWLEDGE ACQUISITION AND EXPOSITION IN EXPERT SYSTEMS Annual Technical Progress Report, 1 Jan. - Dec. 1981
Edward H. Shortliffe, Michael R. Genesereth, and J. S. Wallis Dec. 1981 16 p refs
(Contract N00014-81-K-0004; NR Proj. 154-436)
(AD-A112936) Avail: NTIS HC A02/MF A01 CSCL 09/2

During the first year of research, we have studied the design and development of optimal techniques for the computer-based representation of expert knowledge. As discussed in our proposal, we have concentrated on issues of knowledge acquisition and explanation. Because the underlying choice of a knowledge representation is key, much of the early work has involved experiments with alternate representation techniques. In this progress report we have organized our discussion around the individual subprojects that are underway. It should be noted, however, that there is a unifying research theme (knowledge representation for knowledge acquisition and explanation) that ties together the projects and the participating scientists and students. When technical reports have been prepared in the last year, we have indicated so in the discussion and included the reports as attachments to this summary. GRA

N82-28048# Massachusetts Univ., Amherst. Dept. of Mathematics and Statistics.
APPLICATIONS OF FUNCTIONAL ANALYTIC AND MARTINGALE METHODS TO PROBLEMS IN QUEUEING NETWORK THEORY Final Technical Report, 1 Nov. 1980 - 31 Dec. 1981
Walter A. Rosenkrantz 19 Feb. 1982 3 p
(Grant AF-AFOSR-0036-81; AF Proj. 2304)
(AD-A113046; AFOSR-82-0256TR) Avail: NTIS HC A02/MF A01 CSCL 12/2

This report lists the author's publications, lectures, symposia and consulting activities. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-28049# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
POLYNOMIAL SYSTEMS IN A CATEGORY
G. Naude Sep. 1981 12 p refs
(CSIR-TWISK-229) Avail: NTIS HC A02/MF A01

Discrete time systems described by equations of the form $q(t+1) = P(q(t),U(t))$, $y(t) = H(q(t))$ where P and H are polynomial maps, were investigated. A theory of reachability, observability, and realization developed for polynomial systems in the category of k-affine spaces is discussed. A functor is introduced as an adjoint process for the category of k-spaces. It is shown that there is a natural transformation eta: chi approaches Z = -xU such that eta Q is epic for every k-space Q. It is deduced that every dynamics delta: Q x U approaches Q induces in a natural way a dynamics delta: chi Q approaches q, so that the theory of chi-systems is more general than that of -xU systems. A 'dynamic interpretation functor' is constructed which assigns to a chi-system its underlying sequential machine. M.G.

N82-28050# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A GLOBAL METHOD FOR SOLVING STIFF DIFFERENTIAL EQUATIONS
Laurette Rolfes Aug. 1981 195 p refs
(CSIR-TWISK-228) Avail: NTIS HC A09/MF A01

A global method for solving stiff differential equations is presented and evaluated. The approach is similar to that followed when solving two point boundary value problems. The derivatives in the initial value problem are approximated by central finite difference expressions at all the N - 1 interior points and by a backward finite difference expression of matching order at the end points. This gives rise to a set of N algebraic equations in the N unknowns; the approximations to the exact solutions at the points x sub n, n = 1,2...,N may then be solved simultaneously to obtain the approximate solution y sub n, n = 1,...,N over the whole interval considered. The implementation considered is based on second order finite difference approximations, causing the global method to be a second order method that is unconditionally stable. Higher order methods may be obtained by using higher order approximations or extrapolation techniques without sacrificing unconditional stability. It is concluded that the global method is a robust, reliable method for stiff systems. J.D.

N82-28051# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

GENERALIZED RANK CONDITIONS FOR SYSTEMS IN A CATEGORY
Cornelia Nolte Aug. 1981 20 p refs
(CSIR-TWISK-224) Avail: NTIS HC A02/MF A01

A generalized rank condition is used to deduce necessary and sufficient conditions for the reachability and observability of a system in a category. A duality principle between reachability and observability is established. These results generalize those known previously for bilinear and linear systems over rings. M.G.

N82-28052# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
POLYNOMIAL SYSTEMS AS ADJOINT PROCESS MACHINES
Gert Naude Aug. 1981 21 p refs
(CSIR-TWISK-223) Avail: NTIS HC A02/MF A01

By defining a suitable adjoint process in the category of k-spaces, it is shown that systems that can be described by polynomial equations can be studied via the Arbib-Manes model of machines in a category. Basic results regarding reachability, observability, and realization are derived from the general theory. M.G.

N82-28053# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE USE OF AUTO-CORRELATION TO DETERMINE THE PSEUDO-RANK OF NOISY ILL-CONDITIONED SYSTEMS OF LINEAR EQUATIONS
M. L. Baart Aug. 1981 16 p refs
(CSIR-TWISK-222) Avail: NTIS HC A02/MF A01

The determination of the pseudo-rank of a system of linear equations is complicated by ill conditioning and the presence of noise in the matrix elements and/or data. A method is proposed for selecting a pseudo-rank suitable for calculating approximate least squares solutions, by considering autocorrelation properties of the residual vector. The method is inspired by one previously proposed for the fitting of curves to data, and presupposes a given ordering of the equations. The method is applied to selected ill-conditoned systems with added random noise, and the accuracy of the calculated solutions is investigated. Pseudo-ranks determined by generalized cross validation are used for comparison, and the relative accuracy of the computed solutions is considered. Results indicate that for the examples considered, autocorrelated pseudo-rank determination is more reliable. M.G.

N82-28054# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
NUMERICAL STABILITY OF THE FAST CONVERGENT DIAGONALLY APPROXIMATING DIFFERENCE SCHEMES
Elemer E. Rosinger Aug. 1981 32 p refs
(CSIR-TWISK-220) Avail: NTIS HC A03/MF A01

A general nonlinear method for the uniform approximation of sufficiently smooth solutions of nonlinear evolution partial differential equations (PDEs) by solutions of specially constructed sequences of ordinary differential equations (ODEs) is discussed. Computer applications showed that explicit one-step numerical approximations of the solutions of the ODEs exhibited fast convergence to the smooth solution of the initial evolution PDEs. The stability of the fast convergent diagonal approximation in the presence of round-off errors is proved. For the sake of simplicity the proof is given for the linear case of a pure initial value problem with data in a certain class of quasi-analytic functions. It is also possible, but more difficult, to prove stability in the nonlinear case and for a wider classes of initial data. M.G.

N82-28055# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A CRAMER RULE FOR LEAST-NORM SOLUTIONS OF CONSISTENT LINEAR EQUATIONS
Adi Ben-Israel (Delaware Univ., Newark) Oct. 1981 7 p refs
(CSIR-TWISK-235) Avail: NTIS HC A02/MF A01

The least (Euclidean-) norm solution of a consistent linear equation $Ax = b$ is given a determinantal form. This reduces the Cramer's rule if A is nonsingular. Author

N82-28056*# New Mexico State Univ., Las Cruces. Dept. of Mathematical Sciences.
GEOMETRICALLY DERIVED DIFFERENCE FORMULAE FOR THE NUMERICAL INTEGRATION OF TRAJECTORY PROBLEMS
R. J. Y. McLeod and J. M. Sanz-Serna (Univ. del Pais Vasco, Lejoona, Spain) Sep. 1981 34 p refs Sponsored in cooperation with NASA, NATO, and the British Council in Spain Prepared in cooperation with NRIMS, Pretoria, South Africa
(NASA-CR-169098; NAS 1.26:169098; CSIR-TWISK-231) Avail: NTIS HC A03/MF A01 CSCL 12A

The term 'trajectory problem' is taken to include problems that can arise, for instance, in connection with contour plotting, or in the application of continuation methods, or during phase-plane analysis. Geometrical techniques are used to construct difference methods for these problems to produce in turn explicit and implicit circularly exact formulae. Based on these formulae, a predictor-corrector method is derived which, when compared with a closely related standard method, shows improved performance. It is found that this latter method produces spurious limit cycles, and this behavior is partly analyzed. Finally, a simple variable-step algorithm is constructed and tested. M.G.

N82-28057# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SPLINES AND THE PROJECTION COLLOCATION METHOD FOR SOLVING INTEGRAL EQUATIONS IN SCATTERING THEORY
M. Brannigan and D. Eyre Sep. 1981 28 p refs
(CSIR-TWISK-230) Avail: NTIS HC A03/MF A01

The method of projection collocation using cubic B-spline approximants to solve singular integral equations arising in scattering theory is examined. Theoretical error bounds are provided for the approximation which give criteria for estimating the efficiency and convergence of the method. As numerical examples, the two-body K-matrix equation with a separable potential and the Reid 'S sub 0 soft-core potential are solved. M.G.

N82-28058# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
PROCEEDINGS OF THE SYMPOSIUM OF DESIGN APPLICATIONS OF THE FINITE ELEMENT METHOD, VOLUME 1
1981 154 p refs Symp. held at Cape Town, 12-14 Jan. 1981 3 Vol.
Avail: NTIS HC A08/MF A01

The current state of the finite element method (FEM) for static analysis is discussed. Computer aided design of circular shells is addressed. Finite strip analysis of curved plate is discussed. FEM modelling of time dependent effects of concrete is presented. Boundary integrals as an alternative to finite elements for plane elasticity problems are considered. Nonlinear analysis of reinforced concrete structures by finite element substructuring and numerical integration is also discussed. N.W.

N82-28059# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
PROCEEDINGS OF THE SYMPOSIUM ON DESIGN APPLICATIONS OF THE FINITE ELEMENT METHOD, VOLUME 2
1981 148 p refs Symp. held at Cape Town, 12-14, Jan. 1981 3 Vol.
Avail: NTIS HC A07/MF A01

The static and dynamic analysis of three dimensional frames using nonprismatic elements is discussed. Bifurcation of plastic pressurized thick-walled cylinders is considered. Shipping of PTFE bearings on long bridges is discussed. Nonlinear geometric material and time dependent analysis of reinforced and prestressed slab panels are considered. Finite element analysis of dynamically loaded homogeneous viscous beams is discussed. An algorithm to solve the piecewise linear contact problem is presented. N.W.

N82-28060# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
PROCEEDINGS OF THE SYMPOSIUM ON DESIGN APPLICATIONS OF THE FINITE ELEMENT METHOD, VOLUME 3
1981 112 p refs Symp. held at Cape Town, 12-14 Jan. 1981 3 Vol.
Avail: NTIS HC A06/MF A01

Practical applications of the finite element method (FEM)

are discussed. Aspects of FEM modelling of large structures are considered. Practical views on effective computer analysis are discussed. Partial elimination techniques for structural equations are explained. FEM analysis of tall buildings is addressed. Sub structuring in finite element analysis is considered. N.W.

N82-28061*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SHOCK-FITTED EULER SOLUTIONS TO SHOCK VORTEX INTERACTIONS

Manuel D. Salas, Thomas A. Zang (Coll. of William and Mary, Williamburg, Va.), and M. Yousuff Mussaini May 1982 20 p refs

(NASA-TM-84481; NAS 1.15:84481) Avail: NTIS HC A02/MF A01 CSCL 12A

The interaction of a planar shock wave with one or more vortexes is computed using a pseudospectral method and a finite difference method. The development of the spectral method is emphasized. In both methods the shock wave is fitted as a boundary of the computational domain. The results show good agreement between both computational methods. The spectral method is, however, restricted to smaller time steps and requires use of filtering techniques. M.G.

N82-28062*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

APPLICATION OF TWO-POINT DIFFERENCE SCHEMES TO THE CONSERVATIVE EULER EQUATIONS FOR ONE-DIMENSIONAL FLOWS

Stephen F. Wornom May 1982 45 p refs

(NASA-TM-83262; NAS 1.15:83262) Avail: NTIS HC A03/MF A01 CSCL 12A

An implicit finite difference method is presented for obtaining steady state solutions to the time dependent, conservative Euler equations for flows containing shocks. The method used the two-point differencing approach of Keller with dissipation added at supersonic points via the retarded density concept. Application of the method to the one-dimensional nozzle flow equations for various combinations of subsonic and supersonic boundary conditions shows the method to be very efficient. Residuals are typically reduced to machine zero in approximately 35 time steps for 50 mesh points. It is shown that the scheme offers certain advantages over the more widely used three-point schemes, especially in regard to application of boundary conditions. M.G.

N82-28063*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ON THE APPLICATION AND EXTENSION OF HARTEN'S HIGH RESOLUTION SCHEME

H. C. Yee, R. F. Warming, and Amiran Harten (New York Univ.) Jun. 1982 39 p refs

(NASA-TM-84256; A-8952; NAS 1.15:84256) Avail: NTIS HC A03/MF A01 CSCL 12A

Extensions of a second order high resolution explicit method for the numerical computation of weak solutions of one dimensonal hyperbolic conservation laws are discussed. The main objectives were (1) to examine the shock resoluton of Harten's method for a two dimensional shock reflection problem, (2) to study the use of a high resolution scheme as a post-processor to an approximate steady state solution, and (3) to construct an implicit in the delta-form using Harten's scheme for the explicit operator and a simplified iteration matrix for the implicit operator. M.G.

N82-28064# Army Materials and Mechanics Research Center, Watertown, Mass. Mechanics of Materials Div.

DETERMINATION OF STRUCTURAL RELIABILITY USING A FLAW SIMULATION SCHEME Final Report

Donald M. Neal and Donald S. Mason Oct. 1981 22 p Presented at the 24th Conf. on the Design of Experiments, Wisconsin Univ., Sep. 1978

(DA Proj. 1X4-64621-DO-73)

(AD-A112054; AMMRC-TR-81-53) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper describes structural reliability developed an assumed flaw simulation scheme combined with an idealized linear elastic fracture mechanics model. In the reliability computation, it has been demonstrated that application of this scheme can provide a sensitivity analysis in relation to flaw detection capabilities. To demonstrate the versatility of the method, reliability numbers were obtained for both a simply loaded fragmentation shell and an antitank projectile subjected to a complex stress state. The flaw simulation scheme results are compared to corresponding reliability determinations from conventional Weibull and Warner stress-strength diagram methods. Both the weakest link and series-parallel system are evaluated for desirability in estimating structural reliability. The weakest link approach, which introduces reliability independence between elements, will thereby describe a much more conservative reliability estimate than the series-parallel system which requires at least two adjacent elements to fail in order to have structural failure. Examining the reliability computation for both structures as a function of assumed minimum detectable crack sizes indicated the importance of determining relatively small cracks to obtain acceptable reliability. GRA

N82-28065# Florida State Univ., Tallahassee. Dept. of Statistics.

TESTING WHETHER ONE REGRESSION FUNCTION IS EVERYWHERE LARGER THAN ANOTHER

Roger L. Berger Feb. 1982 26 p refs

(Contract DAAG29-79-C-0158)

(AD-A112212; FSU-STATISTICS-M607; TR-D-52; ARO-16713.17-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of testing whether one regression function is larger than another on a specified compact set R is considered. The regression functions must be linear functions of the parameters but need not be linear functions of the independent variables. The proposed test statistic is compared to a standard t percentile. The test has an exactly specified size in typical situations. Properties of the power function of the test are investigated. The related question of comparing a regression function to a specified function is also considered. Author (GRA)

N82-28066# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.

A BRANCH AND BOUND BASED HEURISTIC FOR SOLVING THE QUADRATIC ASSIGNMENT PROBLEM

M. S. Bazaraa and O. Kirca Oct. 1981 37 p refs

(Contract N00014-80-K-0709; Grant NSF ENG-79-08375)

(AD-A112858; PDRC-81-13) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper a branch and bound algorithm is proposed for solving the quadratic assignment problem. Using symmetric properties of the problem, the algorithm eliminates 'mirror image' branches, thus reducing the search effort. Several routines that transform the procedure into an efficient heuristic are also implemented. These include certain 2-way and 4-way exchanges, selective branching rules, and the use of variable upper bounding techniques for enhancing the speed of fathoming. The computational results are quite encouraging. As an exact scheme, the algorithm solved the 12 facility problem of Nugent et al and the 19 facility problem of Elshafei. More importantly, as a heuristic, the procedure produced the best known solutions for all well-known problems in the literature, and produced improved solutions in several cases. Author (GRA)

N82-28067# Purdue Univ., Lafayette, Ind. Dept. of Statistics.

SEQUENTIAL SELECTION PROCEDURES: A DECISION THEORETIC APPROACH

Shanti S. Gupta and Klaus J. Miescke Mar. 1982 29 p refs

(Contract N00014-75-C-0455)

(AD-A112778; MMS-SER-82-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let pi(l),...,pi(k) be given populations associated with unknown real parameters Theta(l),...,Theta(k), which are related to a common underlying exponential family. Permutation invariant sequential procedures of the following type are considered. At stage m, observations are drawn from all eligible populations, i.e. from those which have not been eliminated so far. Then either the procedure stops and makes a final subset selection from the eligible populations, or it selects a subset from the eligible populations and proceeds to stage m+1. Under a general loss structure (favoring large parameters), it is shown that at all stages and finally selected subsets have to be associated

with the largest sufficient statistics from the eligible populations. In fact, these natural final decisions are proved to be uniformly optimum in terms of the associated risk. Under the assumption of a strongly unimodal exponential family, several consequences are derived with respect to optimality of natural subset selections at various stages. Especially, in the class of q-stage procedures with fixed predetermined subset sizes at the q stages, the natural procedure is uniformly optimum in terms of the risk. All results are derived using the Bayes approach with respect to permutation symmetric priors. The technique of backward induction is used, and the concept of decrease in transportation (DT), introduced by Hollander, Proschan and Sethuraman (1977), plays a crucial role throughout the paper. GRA

N82-28068# Stanford Univ., Calif. Dept. of Computer Science.

BOUNDARY CONDITIONS FOR HYPERBOLIC SYSTEMS OF PARTIAL DIFFERENTIAL EQUATIONS HAVING MULTIPLE TIME SCALES Ph.D. Thesis

Robert Lynn Higdon Aug. 1981 138 p refs

(Contract N00014-75-C-1132; NR Proj. 044-492; R0140201) (AD-A112766; SU-STAN-CS-81-890) Avail: NTIS HC A07/MF A01 CSCL 20/4

This paper is concerned with linear hyperbolic systems of partial differential equations for which certain of the associated propagation speeds are a great deal larger than the other propagation speeds. In certain cases the fast modes allowed by such a system are not present in the true physical solution. Yet the fact that such modes are allowed means that when one tries to compute a numerical solution to an initial-boundary value problem, the errors generated can propagate quite rapidly. In particular, when the boundary data used for the computation are less accurate then the initial data, the fast modes can cause a rapid contamination of the calculation in the interior. To prevent this, one would like to have boundary conditions which prevent fast waves from entering the region. The goal of this paper is to find such conditions. GRA

N82-28069# Stanford Univ., Calif. Systems Optimization Lab.

VARIABLE METRIC RELAXATION METHODS. PART 1: A CONCEPTUAL ALGORITHM

Jean-Louis Goffin (McGill Univ.) Aug. 1981 103 p refs

(Contracts DE-AM03-76SF-00326; DE-AT03-76ER-72018; N00014-75-C-0267; Grants NSF MCS-76-81259; NSF MCS-79-26009; NSF ECS-80-12974)

(AD-A107461; SU-SOL-81-16) Avail: NTIS HC A06/MF A01 CSCL 12/1

A variable metric, maximal ellipsoidal distance, relaxation method for solving systems of linear, inequalities is described and its rate of convergence analyzed. This algorithm, with a termination routine appended to it, is polynomial if the ellipsoid matrix approximates an inverse 'Hessian,' which may be defined through the largest ellipsoid contained in a perturbation cum compactification of the feasible set. This so called inverse Hessian is given by a positive linear combination of symmetric rank one matrices built on the vectors given by the facets of the perturbation cum compactification of the feasible set.

Author (GRA)

N82-28070# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Computer Science.

SIGNIFICANCE OF PROBLEM SOLVING PARAMETERS ON THE PERFORMANCE OF COMBINATORIAL ALGORITHMS ON MULTI-COMPUTER PARALLEL ARCHITECTURES

W. M. McCormack, F. Gail Gray, and Robert M. Haralick 3 Mar. 1982 31 p refs

(Contract N00014-80-C-0689)

(AD-A112487) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper describes the interaction between specific algorithm parameters and the parallel computer architecture. The classes of architectures we consider are those which have inherent distributed control and whose connection structure is regular. Combinatorial problems require solutions which do searching. This experiment has determined an optimum problem solving strategy for the consistent labeling problem. One combination of factors, depth first search strategy-transmit large problems-transmit 50% of a processor's work, was found to be statistically best, especially for large problem sizes or for architectures with restricted communications paths. GRA

N82-28071# Center for Naval Analyses, Alexandria, Va. Naval Studies Group.

TESTING FOR STRUCTURAL CHANGE BY D-METHODS IN SWITCHING SIMULTANEOUS EQUATIONS MODELS

Lung-Fei Lee, G. S. Maddala, and R. P. Trost Feb. 1982 14 p refs

(Contract N00014-76-C-0001)

(AD-A112482; CNA-PP-342) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper presents an extension of the Goldfeld-Quant D-method to switching simultaneous equation systems with endogenous switching. The method is useful to apply tests for equality of coefficients across regimes in switching simultaneous equation systems with selectivity. The paper derives the valid instrumental variables to use in this situation, the asymptotic covariance matrix of the suggested estimator and gives an empirical illustration. Author (GRA)

N82-28072# Naval Underwater Systems Center, Newport, R.I. Combat Control Systems Dept.

COMPUTATIONAL ASPECTS OF CONSTRAINED ESTIMATION

L. M. Cabral 1 Mar. 1982 34 p refs

(AD-A113566; NUSC/TR-6068) Avail: NTIS HC A03/MF A01 CSCL 12/1

Hybrid estimation strategies can exploit both deterministic and statistical a priori and (more generally) exogenous information for the solution of improperly stated problems. Computationally, problems remain improperly stated due to numerical round-off or algorithmic non-computability. A compact quadratic optimization procedure is presented that resolves this problem, as well as decreases computation time. Author (GRA)

N82-28073# Naval Coastal Systems Center, Panama City, Fla. Systems Science Div.

AN OUTLINE OF THE TRANSITION PROBABILITY FUNCTION APPROACH TO STOCHASTIC SYSTEMS

James A. Reneke Feb. 1982 36 p refs

(AD-A112325; AD-F200020; NCSC-TM-339-82) Avail: NTIS HC A03/MF A01 CSCL 12/1

Problems of estimation, control, and qualitative analysis for noisy engineering systems can be approached either from the sample path or the transition probability function perspective. The second approach is outlined in this report in a series of examples with enough theory to make the material self contained. Special attention is given the relationship between engineering models and Kolmogorov's partial differential equations.

Author (GRA)

N82-28074# Naval Ocean Systems Center, San Diego, Calif. Electronics Div.

ANALYSIS OF AN ALGORITHM OF BITMEAD AND ANDERSON FOR THE INVERSION OF TOEPLITZ SYSTEMS Technical Report, Jun. - Jul. 1981

Harlan Sexton 7 Jan. 1982 36 p refs

(AD-A112477; NOSC/TR-756) Avail: NTIS HC A03/MF A01 CSCL 12/1

In a paper entitled 'Asymptotically Fast Solution of Toeplitz and Related Systems of Linear Equations,' Bitmead and Anderson present an algorithm for the inversion of Toeplitz and related matrices. In this report their results are examined and some extensions are presented. GRA

N82-28075# Naval Ocean Systems Center, San Diego, Calif. Signal Processing and Display Div.

MAXIMUM LIKELIHOOD ESTIMATION OF MAGNITUDE-SQUARED COHERENCE Interim Technical Report, Apr. - Jun. 1981

G. L. Mohnkern 24 Aug. 1981 16 p refs

(XF111011001)

(AD-A107352; NOSC/TR-717) Avail: NTIS HC A02/MF A01 CSCL 12/1

A maximum likelihood estimator (MLE) for coherence is derived. The MLE should be unbiased, and there should be no unbiased estimator with smaller variance. An approximation to

the MLE, valid for coherence estimates with high degrees of freedom (dof), is also calculated. The two MLE algorithms and two estimators discussed in earlier literature are compared in a simulation of 8192 Calculators of coherence estimates with eight dof. The MLE calculations are consistently closer to the design coherences than the other estimators. The approximation to the MLE performs suprisingly well, considering the coherence estimates have only eight dof. Author (GRA)

N82-28076# Naval Underwater Systems Center, New London, Conn.

ON RESONANCE EXTRACTION AND WAVEFORM FITTING FOR TRANSIENT DATA: PRONY'S METHOD

Albert H. Nuttall 9 Mar. 1982 24 p refs
(ZR0000101)
(AD-A112378; NUSC-TR-6639) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report explains the basic philosophy and mathematics of waveform fitting with complex exponentials, when the available data points are more than the number needed for a perfect fit. The connection with Prony's method is developed, some recent new work by Auton and Van Blaricum is summarized, and an eigenvector generalization of linear prediction is presented. Effort is still continuing in this important field of resonance estimation and extraction, and answers to some important questions on sensitivity, sampling rate, and bias are still not available. Author (GRA)

N82-28077# IIT Research Inst., Chicago, Ill.

USERS CODE FOR THE FINITE-DIFFERENCE TIME-DOMAIN METHOD Final Technical Report, 30 Sep. 1980 - 30 Sep. 1981

Allan Taflove and Korada Umashankar Griffiss AFB, N.Y. RADC Feb. 1982 110 p refs
(Contract F30602-80-C-0302; AF Proj. 2064)
(AD-A113598; RADC-TR-82-16) Avail: NTIS HC A06/MF A01 CSCL 12/1

Electromagnetic penetration and scattering problems are difficult to treat with many analytical or numerical methods because of the inability of these methods to simply deal with the effects of structure materials, apertures, curvatures, corners, and internal contents. In previous programs, a new approach for the direct modeling of very complex electromagnetic interaction problems was studied: the finite-difference, time-domain (FD-TD) solution of Maxwell's equations. The FD-TD method has key advantages relative to available modeling approaches. These advantages permit it to accurately treat complex problems that are beyond the scope of solution by any other method. The goals of the present research program included the development of specific algorithms of high importance to help provide a flexible, simple-to-use, and highly accurate user-oriented FD-TD computer program. Five key improvements in the FD-TD algorithm were tested during this effort, including the following: (1) Total-field/scattered-field lattice division, (2) Variable angle of incidence, (3) Second-order accurate radiation condition, (4) Magnitude and phase computation condition for the sinusoidal steady state, and (5) Near-to-far field transformation. GRA

N82-28078# Purdue Univ., Lafayette, Ind. Dept. of Statistics.

SELECTING PROCEDURES FOR OPTIMAL SUBSET OF REGRESSION VARIABLES

Shanti S. Gupta and Deng-Yuan Huang Jan. 1982 10 p refs
(Contract N00014-75-C-0455; NR Proj. 042-243)
(AD-A113971; MMS-82-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

Recently a number of methods have been developed for selecting the best or at least a good subset of variables in regression analysis. For various reasons, we may be interested in including only a subset, say, of size $r < p$, the number of independent variables. Various authors have considered this problem and a variety of techniques are presently being used to construct such subsets. In this paper, we are interested in deriving an optimal decision procedure based on residual mean squares to select a subset excluding all inferior independent variables. This kind of optimality criterion is related to the approach of Gupta and Huang (1977). Author (GRA)

N82-28079# University of Southern California, Los Angeles. Dept. of Mathematics.

INVERSE PROBLEMS FOR NONLINEAR, LARGE DIFFERENTIAL SYSTEMS Interim Report

Jaime Milstein Mar. 1982 8 p refs
(Grant AF-AFOSR-0243-80; AF Proj. 2304)
(AD-A113890; AFOSR-82-0290TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research completed includes the following: The dynamics of a system of nonlinear ordinary differential equation depends on the constant coefficients (parameters) of the system. Identifying these coefficients from the solution curves defines an inverse problem. A method to determine the values of the parameters from a finite number of solution curves was developed and implemented. The method consist of two major algorithmic procedures: (1) A derivative free nonlinear optimization, and (2) An error analysis of the parameters found. Author (GRA)

N82-28080# Maryland Univ., College Park. Lab. for Numerical Analysis.

GENERALIZED FINITE ELEMENT METHODS: THEIR PERFORMANCE AND THEIR RELATION TO MIXED METHODS

I. Babuska and J. E. Osborn Nov. 1981 65 p refs
(Contract N00014-77-C-0623; Grant NSF MCS-78-02851)
(AD-A113663; BN-975) Avail: NTIS HC A04/MF A01 CSCL 13/1

The notion of a generalized finite element method is introduced. This class of methods is analyzed and their relation to mixed methods is discussed. The class of generalized finite element methods offers a wide variety of computational procedures from which particular procedures can be selected for particular problems. A particular generalized finite element method which is very effective for problems with rough coefficients is discussed in detail. Author (GRA)

N82-28081# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

CONVERGENCE AND ASYMPTOTIC AGREEMENT IN DISTRIBUTED DECISION PROBLEMS

John N. Tsitsiklis and Michael Athans Mar. 1982 21 p refs Presented at the 1982 IEEE Conf. of Decision Control Submitted for publication
(Contract N00014-77-C-0532; NR Proj. 041-519)
(AD-A113602; LIDS-P-1185) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider a distributed team decision problem in which different agents obtain from the environment different stochastic measurements, possibly at different random times, related to the same uncertain random vector. Each agent has the same objective function and prior probability distribution. We assume that each agent can compute an optimal tentative decision based upon his own observation and that these tentative decisions are communicated and received, possibly at random times, by a subset of other agents. Conditions for asymptotic convergence of each agent's decision sequence and asymptotic agreement of all agents' decisions are derived. Author (GRA)

N82-28082# Ohio State Univ., Columbus. Wave Propagation Group.

T-MATRIX FORMULATION TO STUDY THE FREQUENCY DEPENDENT PROPERTIES OF ABSORBING MATERIALS Final Report, 1 Aug. 1980 - 31 Oct. 1981

Vijay K. Varadan and Vasundara V. Varadan 15 Jan. 1982 76 p refs
(Contracts N00014-80-C-0835; N00014-80-C-0483; N00014-78-C-0559; N00014-79-C-0859)
(AD-A113914) Avail: NTIS HC A05/MF A01 CSCL 12/1

A scattering matrix theory is presented for studying the multiple scattering of both longitudinal and transverse elastic waves in a medium containing a random distribution of inclusions or voids of arbitrary shape. A statistical analysis with QCA and Percus-Yevick pair correlation function is then employed to obtain expressions for the average amplitudes of the coherent fields which may be solved to yield the bulk or effective properties of the inhomogeneous medium. Suggestions for incorporating CPA in conjunction with QCA so that materials with dense concentra-

tion of inclusions can be considered are also given.
Author (GRA)

N82-28083# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
FAST PARALLEL MATRIX AND GCD COMPUTATIONS
Allan Borodin, Joachim vonzurGathen, and John E. Hopcroft Apr. 1982 34 p refs Prepared in cooperation with Toronto Univ.
(Contract N00014-76-C-0018)
(AD-A113577; CU-CSD-TR-82-487) Avail: NTIS HC A03/MF A01 CSCL 12/1

We present parallel algorithms to compute the determinant and characteristics polynomial of nxn-matrices and the gcd of polynomials of degree less than or equal n. The algorithms use parallel time O(log to the 2nd power n) and a polynomial number of processors. We also give a fast parallel Monte Carlo algorithm for the rank of matrices. All algorithms work over arbitrary fields. Author (GRA)

N82-28084# Stanford Univ., Calif. Dept. of Computer Science.
NUMERICAL LINEAR ALGEBRA Final Report, 1 Feb. 1979 - 31 Aug. 1981
Gene H. Golub and James H. Wilkinson Aug. 1981 10 p
(Grant AF-AFOSR-0094-79; AF Proj. 2304)
(AD-A113070; AFOSR-82-0258TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research under this contract has been concentrated on major problems in numerical linear algebra: (1) The determination of error bounds for Gaussian elimination, and (2) The generalized eigenvalue problem AX = lambda BX and its natural extension to the computation of the canonical form of the pencil A lambda B where A and B are mxn matrices. In addition, the numerical aspects of various problems in linear system theory and related fields have been studied. Author (GRA)

N82-28085# Stanford Univ., Calif. Dept. of Computer Science.
COMPUTATION OF MATRIX CHAIN PRODUCTS, PART 1, PART 2
T. C. Hu and M. T. Shing Sep. 1981 100 p refs
(Contract DAAG29-80-C-0029; Grant NSF MCS-77-23738)
(AD-A113349; SU-STAN-CS-81-875; ARO-16323.2-M) Avail: NTIS HC A05/MF A01 CSCL 12/1

This paper considers the computation of matrix chain products of the form M sub (1) x M sub (2) x --- X M sub (n-1). If the matrices are so different dimensions, the order in which the product is computed affects the number of operations. An optimum order is an order which minimizes the total number of operations. We present some theorems about an optimum order of computing the matrices. Based on these theorems, and O(n log n) algorithm for finding an optimum order is presented in part 2. GRA

N82-28086# Stanford Univ., Calif. Dept. of Computer Science.
FINDING THE CONVEX HULL OF A SIMPLE POLYGON
Ronald L. Graham and Frances Yao (Xerox Palo Alto Research Center) Nov. 1981 10 p refs
(Contract N00014-81-K-0269; Grant NSF MCS-77-23738)
(AD-A113420; SU-STAN-CS-81-887) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is well known that the convex hull of a set of n points in the (Euclidean) plane can be found by an algorithm having worst-case complexity O(n log n). In this note we give a short linear algorithm for finding the convex hull in the case that the (ordered) set of points from the vertices of a simple (i.e., non-self-intersecting) polygon. Author (GRA)

N82-28087# Stanford Univ., Calif. Dept. of Computer Science.
FAST MATRIX MULTIPLICATION WITHOUT APA-ALGORITHMS
V. Ya. Pan Oct. 1981 31 p refs Prepared in cooperation with State Univ. of New York, Albany
(Contract N00014-81-K-0269; Grants NSF MCS-77-23738; NSF MCS-80-03347)
(AD-A113419; SU-STAN-CS-81-882) Avail: NTIS HC A03/MF A01 CSCL 12/1

The method of trilinear aggregating with implicit canceling for the design of fast matrix multiplication (MM) algorithms is revised and is formally presented with the use of Generating Tables and of linear transformations of the problem of MM. It is shown how to derive the exponent of MM below 2.67 even without the use of approximation algorithms. Author (GRA)

N82-28088# Stanford Univ., Calif. Dept. of Computer Science.
THE LOWER BOUNDS ON THE ADDITIVE COMPLEXITY OF BILINEAR PROBLEMS IN TERMS OF SOME ALGEBRAIC QUANTITIES
V. Ya. Pan (Inst. of Advanced Study) Jun. 1981 5 p refs
(Contract N00014-81-K-0269; Grants NSF MCS-80-03347; NSF MCS-77-23738)
(AD-A112972; SU-STAN-CS-81-862) Avail: NTIS HC A02/MF A01 CSCL 12/1

The lower bounds on the additive complexity of a bilinear problem are expressed in terms of the rank of the problem and also as a minimum number of elementary steps for the transformation of the identity matrix into a strongly regular one.
GRA

N82-28089# Stanford Univ., Calif. Dept. of Computer Science.
THE BIT OPERATION COMPLEXITY OF APPROXIMATE EVALUATION OF MATRIX AND POLYNOMIAL PRODUCTS USING MODULAR ARITHMETIC
V. Ya. Pan Jun. 1981 7 p refs
(Contract N00014-81-K-0269; Grant NSF MCS-77-23738)
(AD-A112973; SU-STAN-CS-81-858) Avail: NTIS HC A02/MF A01 CSCL 12/1

The approximate evaluation with a given precision of matrix and polynomial products is performed using modular arithmetic. The resulting algorithms are numerically stable. At the same time they are as fast as or faster than the algorithms with arithmetic operations over real or complex numbers. GRA

N82-28090# Stanford Univ., Calif. Dept. of Computer Science.
THE ADDITIVE AND LOGICAL COMPLEXITIES OF LINEAR AND BILINEAR ARITHMETIC ALGORITHMS
V. Ya. Pan Jun. 1981 23 p refs Prepared in cooperation with Inst. for Advanced Study, Princeton, N. J.
(Contract N00014-81-K-0269; Grants NSF MSC-80-03347; NSF MCS-77-23738)
(AD-A112974; SU-STAN-CS-81-859) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that CA(+ or -) + do(D(A)) + ir(D(A)) = omega(K + Q)log(K + Q) and CA(+ or -) + do(D(A)) = omega(K + Q)log(K + Q) in the cases of DFT, vector convolution, and matrix multiplication. Here CA(+ or -) is the additive complexity of a (bi)linear algorithm A for the given problem, D(A) and D(A) are the two acyclic digraphs that represent A, each of them is obtained from another one by reversing directions of all edges, ir(D) and do(D) are two numbers that are introduced to measure the structural deficiencies of an acyclic digraph D. K and Q are the numbers of outputs and input-variables. Do(D(A)), do(D(A)), and ir(D(A)) characterize the logical complexity of A. Also lower bounds on C(A)(+ or -) + do(D(A)) and on C(A)(+ or -) are expressed in terms of algebraic quantities such as the ranks of matrices and of multidimensional tensors associated with the problems.
Author (GRA)

N82-28091# Naval Research Lab., Washington, D. C. Applied Ocean Acoustics Branch.
FOURIER TRANSFORM RECONSTRUCTION FROM INEXACT DATA Interim Report
C. L. Byrne and R. M. Fitzgerald 15 Apr. 1982 11 p refs (RR0210542)
(AD-A113770; NRL-8573) Avail: NTIS HC A02/MF A01 CSCL 12/1

Methods for the linear reconstruction of Fourier transforms based on approximation-theoretic techniques are extended to the case of imprecise samples. Statistics of these estimators in the presence of random noise are calculated, and the special case of sinusoids in noise is discussed. Biased estimates of sinusoid

amplitudes are obtained and related to the best linear unbiased estimates (BLUE). Author (GRA)

N82-28092# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
ANOTHER STRATEGY FOR FAST 'POISSON' SOLVING WITH NON-CONSTANT COEFFICIENTS Interim Report
J. P. Boris 9 Apr. 1982 8 p
(Contract N00014-82-AE-00001; RR0110943)
(AD-A113769; NRL-MR-4715) Avail: NTIS HC A02/MF A01 CSCL 12/1

The key to fast Poisson solving in an extended domain is nonlocal residual error dispersal. The fastest, most stable iterations are obtained when 'most' of the nonconstant-coefficient elliptic operator can be inverted implicitly. Although local inversion approaches (ICCG, SOR, etc.) are workable, there are good incentives to seek computationally inexpensive nonlocal techniques whose worst case convergence is expected to be far better than for local inverse techniques. This note presents one such approach for a useful class of variable coefficient problems. Author (GRA)

N82-28093# Naval Underwater Systems Center, New London, Conn. Information Services Dept.
AN EXPANSION OF THE GEGENBAUER POLYNOMIAL (CN SUPERSCRIPT MU) (XY)
Roy L. Streit 25 Mar. 1982 15 p refs
(AD-A113639; NUSC-TR-6579) Avail: NTIS HC A02/MF A01 CSCL 12/1

An expansion of the Gegenbauer polynomial (Cn superscript mu)(xy) in an orthogonal series in the polynomials (Ck superscript lambda)(x) with coefficients depending on y is derived. The coefficients of (Ck superscript lambda)(x) in the expansion are derived in a form that, by inspection, shows them to be positive for y > 1 and mu > or = lambda > or = 0. A limiting form for these expansion coefficients is also derived. This limiting form, together with an apparently new formula of Mehler-Heine type, is shown to imply Sonine's second finite integral. Author (GRA)

N82-28094# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
OPTIMAL SENSOR SCHEDULING FOR MULTIPLE HYPOTHESIS TESTING
Robert R. Tenney Sep. 1981 74 p refs
(Contract N00014-77-C-0532; NR Proj. 041-519)
(AD-A113399; LIDS-P-1179) Avail: NTIS HC A04/MF A01 CSCL 09/4

The generic problem of selecting the sequence of sensors which optimizes the information received about a number of discrete hypotheses is considered. The optimization criterion penalizes the uncertainty present about pairs of hypotheses in a form which has an eigenfunction property with respect to a Bayes update of the conditional probability distribution. Application of the Portryagin minimum principle yields elegant solutions to an interesting class of problems. Applications in surveillance, failure detection, and nondestructive testing are possible. Author (GRA)

N82-28095# Brown Univ., Providence, R. I. Center for Dynamical Systems.
CUBIC SPLINE APPROXIMATION TECHNIQUES FOR PARAMETER ESTIMATION IN DISTRIBUTED SYSTEMS Interim Report
H. T. Banks, J. M. Crowley, and K. Kunisch Nov. 1981 51 p refs
(Grant AF-AFOSR-0198-81)
(AD-A113021; LCDS-81-25; AFOSR-82-022TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Approximation schemes employing cubic splines in the context of a linear semigroup framework are developed for both parabolic and hyperbolic second order partial differential equation parameter estimation problems. Convergence results are established for problems with linear and nonlinear systems and a summary of numerical experiments with the techniques proposed is given. Author (GRA)

N82-28096# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
A SIMPLE AND EFFICIENT BYZANTINE GENERALS ALGORITHM Interim Report
Nancy A. Lynch, Michael J. Fischer, and Robert Fowler Feb. 1982 15 p refs
(Contracts N00014-80-C-0221; DAAG29-79-C-0155; Grants NSF MCS-79-24370; NSF MCS-81-16678)
(AD-A113241; GIT-ICS-82/02) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Byzantine Generals problem involves a system of N processes, t of which may be unreliable. The problem is for the reliable processes to agree on a binary value sent by a general, which may itself be one of the N processes. If the general sends the same value to each process, then all reliable processes must agree on that value, but in any case, they must agree on the same value. We give an explicit solution for N=3t+1 processes, using 2t+4 rounds and O(t-cubed log t) message bits, where t bounds the number of faulty processes. This solution is easily extended to the general case of N > or = 3t+1 to give a solution using 2t+5 rounds and O(tN+T-cubed log t) message bits. Author (GRA)

N82-28097# Maryland Univ., College Park. Computer Vision Lab.
APPROXIMATING POINT SET IMAGES BY LINE SEGMENTS USING A VARIATION OF THE HOUGH TRANSFORM
Philip R. Thrift and Stanley M. Dunn Sep. 1981 18 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A113014; TR-1105; AFOSR-82-0238TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A transform method presented in an earlier paper (AD-A095 973) for the detection of curves in noisy point set images is used here to detect line segments in such images. The results of this transform are compared to results from the Hough transform. GRA

N82-28098# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Physics.
A CLASS OF YANG-MILLS SOLUTIONS
L. Castillejo and M. Kugler Sep. 1980 30 p refs
(WIS-Ph-80/39) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The symmetry of the class prescribes a natural set of gauge invariant degrees of freedom. Using these degrees of freedom, a simple set of equations were obtained which were used to find all the solutions belonging to the class under discussion. T.M.

N82-28099 California Univ., Livermore. Lawrence Livermore Lab.
STUDY OF A FAMILY OF SINGULAR SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS
Alan C. Hindmarsh 30 Sep. 1981 12 p refs
(Contract W-7405-eng-48)
(DE82-001200; UCID-19207) Avail: NTIS HC A02/MF A01

The following family of second order differential equations is considered: d/dx(x(2) d phi/dx) = lambda [phi - g(x)], where g(x) is a given function, and lambda is a real constant. It is required that phi(x) be continuous for x greater than or equal to 0 with phi(0) = 0. An analytical solution to the problem is given, and various aspects of a numerical solution are discussed. DOE

N82-28100# California Univ., Livermore. Lawrence Livermore Lab.
MATRIX UPDATE METHODS IN SOLVING STIFF DIFFERENTIAL SYSTEMS
Peter N. Brown (Houston Univ.) Nov. 1981 12 p refs
(Contract W-7405-eng-48)
(DE82-004324; UCID-19239) Avail: NTIS HC A02/MF A01

Initial value problems in ordinary differential equations are investigated. Linear multistep methods, quasi-Newton methods, algorithmic implementation, and test results are included. DOE

N82-28101# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
ON THE LOCAL AND GLOBAL ERRORS OF ONE-LEG METHODS
Germund Dahlquist 1981 22 p refs

(TRITA-NA-8110) Avail: NTIS HC A02/MF A01

The local discretization error of a variable step one-leg method is defined. An asymptotic theory is presented for computations with smoothly varying step size. A two-parameter family of one-leg k-step methods is studied for which the order of consistency is not less than k. Almost-contractivity in variable step size computation is commented on. Author (ESA)

N82-28102# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

ON ONE-LEG AND LINEAR MULTISTEP FORMULAS WITH VARIABLE STEP-SIZES

Joergen Sand 1981 48 p refs Sponsored in part by the Danish Natural Science Research Counsel

(TRITA-NA-8112) Avail: NTIS HC A03/MF A01

The idea of using one-leg formulas instead of linear multistep formulas is considered. Both sets of formulas in the case of variable step-sizes are compared. Whereas useful linear multistep formulas of order p sub n (in the n'th step) with only p sub n + 2 nonvanishing coefficients exist for all p sub n > or = 1, any one-leg formula requires at least 2 p sub n nonvanishing coefficients (p sub n in either characteristic polynomial) in order to obtain the same order. For linear multistep formulas, one of the techniques commonly used to ensure zero or (A infinite) stability, also for the variable-step versions, consists in freezing the roots of one of the characteristic polynomials. This technique applied to any pure one-leg formula causes the order of the variable-step version to be 2 at most (in general). Author (ESA)

N82-28103# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

ON THE EFFICIENT SOLUTION OF NONLINEAR EQUATIONS IN NUMERICAL METHODS FOR STIFF DIFFERENTIAL SYSTEMS

Gustaf Soederlind 1981 48 p refs

(TRITA-NA-8114) Avail: NTIS HC A03/MF A01

Methods that perform efficiently by utilizing some partitioning of stiff differential systems with only few stiff eigenvalues are reviewed and compared. Sparse matrix techniques lead to substantial improvements over the efficiency of implicit methods if the sparsity pattern of the Jacobian is favorable. Other methods all replace the Jacobian by a matrix with some advantageous structure. Thus, the methods are either tearing methods or methods of modification where some or all elements of J are modified in order to make a low-rank approximation possible. Findings indicate that there is no efficient method available today that performs automatic partitioning for general stiff problems. Author (ESA)

N82-28104# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

THEORETICAL AND COMPUTATIONAL ASPECTS ON PARTITIONING IN THE NUMERICAL INTEGRATION OF STIFF DIFFERENTIAL SYSTEMS Ph.D. Thesis

Gustaf Soederlind 1981 14 p refs Sponsored in cooperation with ITM

(TRITA-NA-8115) Avail: NTIS HC A02/MF A01

Concepts of computerized simulation of dynamic systems are summarized. These include stability properties of linear multistep compound discretizations of partitioned differential systems. The computer program DASP3, a program for the numerical integration of partitioned stiff ordinary differential equations and differential algebraic systems, is mentioned. Multiple step G-contractivity with applications to slowly varying linear systems is covered. Error propagation in stiff differential systems of singular perturbation type and the efficient solution of nonlinear equations in numerical methods for stiff differential systems are also treated. Author (ESA)

N82-28105# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

SOLVING AN INTERFACE PROBLEM FOR THE LAPLACE OPERATOR BY THE BOUNDARY COLLOCATION METHOD

Lothar Reichel 1981 31 p refs

(TRITA-NA-8116) Avail: NTIS HC A03/MF A01

A solution in the form of a linear combination of particular solutions of a differential equation is sought in order to obtain approximate solutions to boundary problems for linear partial differential equations. A simple method for doing this is the boundary collocation method (BCM). The BCM is applied to a model interface problem for the Laplace operator. The boundary condition is a continuity condition across the interface. This interface problem as well as a related approximation problem are described. The allocation of collocation points for various subspaces and selection of the subspace are considered through numerical examples. An optimization problem is explicated. Author (ESA)

N82-28106# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

A FAST METHOD FOR SOLVING CERTAIN INTEGRAL EQUATIONS OF THE FIRST KIND WITH APPLICATION TO CONFORMAL MAPPINGS

Lothar Reichel 1981 32 p refs

(TRITA-NA-8117) Avail: NTIS HC A03/MF A01

A fast iterative solution method for Fredholm integral equations of the first kind with a logarithmic kernel as principal part is described. The method is a Fourier-Galerkin method. Due to the singularity of the kernel, the linear system of simultaneous equations is block diagonal dominant and can be solved rapidly by an iterative method. Examples of the computation of conformal mappings of simply and multiply connected domains are presented. Author (ESA)

N82-28107# Sheffield Univ. (England). Dept. of Control Engineering.

ROBUST CONTROLLER DESIGN FOR UNCERTAIN DYNAMIC SYSTEMS USING APPROXIMATE MODELS. PART 1: THE SINGLE-INPUT/SINGLE-OUTPUT CASE

D. Owens and A. Chotai Oct. 1981 54 p refs

(Grant SERC-GR/B/23250)

(RR-161) Avail: NTIS HC A04/MF A01

Controller design for continuous and discrete systems whose models are unknown or highly complex is discussed. These designs are frequently based on the use of a simple, approximate and, very often, rough-and-ready model. In such circumstances it is vital to be able to quantify the degree of uncertainty to be expected from the use of such a model for prediction of closed loop characteristics. It is shown how classical frequency domain design techniques can be extended to incorporate information deduced from the observed differences between open loop plant and approximate model step response to quantify this uncertainty and, in particular, to guarantee closed loop stability and tracking of step demands. A modification of this analysis also yields the possibility of bounding the error in prediction of closed loop transient performance. The approaches are all graphical in nature and can be easily implemented in an interactive computer aided design mode. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-28108# Cape Town Univ. (South Africa).

A HEURISTIC SOLUTION PROCEDURE FOR A JOINT RESERVOIR CONTROL-CAPACITY EXPANSION PROBLEM

Moshe Sniedovich and Peter A. Nielsen (Cape Town Univ.) Sep. 1981 26 p refs

(CSIR-TWISK-218) Avail: NTIS HC A03/MF A01

A joint reservoir control-capacity expansion problem is considered, in which the expansion policy is required to be deterministic. Owing to the difficulty of solving this problem because the release policy is stochastic, a heuristic procedure is proposed utilizing an upper bound to the optimal deterministic solution obtained by solving a modified stochastic problem, and a simple averaging heuristic for transforming stochastic policies into deterministic policies. A simple numerical example demonstrates the overall procedure. M.G.

N82-28109*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

PREDICTING THE REQUIRED NUMBER OF TRAINING SAMPLES

H. M. Kalayeh and D. A. Landgrebe 1982 13 p refs
(Grant NsG-5414)
(NASA-CR-169091; NAS 1.26:169091; LARS-TR-050682)
Avail: NTIS HC A02/MF A01 CSCL 12A

A criterion which measures the quality of the estimate of the covariance matrix of a multivariate normal distribution is developed. Based on this criterion, the necessary number of training samples is predicted. Experimental results which are used as a guide for determining the number of training samples are included. M.G.

N82-28110# California Univ., Los Angeles.
GENERALIZABILITY THEORY: 1973 - 1980
Richard J. Shavelson and Noreen M. Webb Jul. 1981 68 p refs Sponsored in part by the Rand Corp. Submitted for publication
(AD-A110535; RAND/P-6580) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper reviews the developments in generalizability theory from 1973 to 1980. The first section presents a sketch of generalizability theory. The second section reviews theoretical contributions about (1) problems associated with estimating variance components, including sampling variability and negative estimates, (2) fixed facets, (3) criterion-referenced measurement, (4) symmetry, (5) multivariate generalizability, and (6) sampling in observational measurement. The final section presents an illustrative application of generalizability theory, including univariate and multivariate generalizability analyses of balanced and unbalanced designs, and Bayesian estimation of variance components. GRA

N82-28111# Princeton Univ., N. J. Dept. of Statistics.
ROBUST AND LEAST SQUARES ORTHOGONAL MAPPING: METHODS FOR THE STUDY OF CEPHALOFACIAL FORM AND GROWTH
Andrew F. Olshan, Andrew F. Siegel, and Daris R. Swindler Apr. 1982 20 p refs
(Contract DAAG29-79-C-0205; Grants PHS-DE-02918; PHS-RR-00166)
(AD-A113787; TR-222-SER-2; ARO-16669.19-M) Avail: NTIS HC A02/MF A01 CSCL 06/3

A method is presented for the description and analysis of cephalofacial form and growth using two-dimensional coordinate data. The procedure permits the identification of shape differences at specific cephalofacial coordinate locations without reliance upon conventional cephalometric landmarks. The resulting size-standardized coordinates can be analyzed by statistical methods for further data exploration. Two methods of shape transformation - least squares and robust fitting--are described and compared. An example of the utility of the technique for cephalofacial growth studies is provided. Author (GRA)

N82-28112# Princeton Univ., N. J. Dept. of Statistics.
SOME EASY PRIME t PRIME-STATISTICS
Paul S. Horn Nov. 1981 46 p refs
(Contract DAAG29-79-C-0205)
(AD-A113792; TR-214-SER-2; ARO-16669.15-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper explores the use of t-statistics based on two or four order statistics. The functions of the order statistics which are used to define the t-statistics are the hinges. The hinges are approximately the quartiles and are either exact order statistics or the means of two adjacent order statistics. Two t-statistics based on the hinges are examined and compared to other t-statistics, including Student's t, using various criteria. Author (GRA)

N82-28113# Princeton Univ., N. J. Dept. of Statistics.
LOW MEDIAN AND LEAST ABSOLUTE RESIDUAL ANALYSIS OF TWO-WAY TABLES
Andrew F. Siegel Feb. 1982 23 p refs
(Contract DAAG29-79-C-0205)
(AD-A113796; TR-219-SER-2; ARO-16669.18-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Some properties of and extensions to Tukey's method of median polish, an exploratory robust additive decomposition of a two-way table, are presented using the low median. If the table entries are rational numbers, then this modified iteration process must stop after a finite number of steps. However, even for tables of bounded dimension the number of iterations can be arbitrarily large. For the special case of 3 by 3 tables, the sum of absolute residuals is often (but not always) minimized by median polish, especially for tables with strong row or column effects. Methods designed to supplement the polishing process by increasing the number of zero residuals and to obtain a least absolute solution are developed. Author (GRA)

N82-28114# Princeton Univ., N. J. Dept. of Statistics.
MOMENTS OF PARTICLE SIZE DISTRIBUTIONS UNDER SEQUENTIAL BREAKAGE WITH APPLICATIONS TO SPECIES ABUNDANCE
Andrew F. Siegel and George Sugihara Nov. 1981 15 p refs
(Contract DAAG29-79-C-0205)
(AD-A113866; TR-215; SERIES-2; ARO-16669.20-M) Avail: NTIS HC A02/MF A01 CSCL 06/3

The sequential broken stick model has appeared in numerous contexts, including biology, physics, engineering and geology. Kolmogorov showed that under appropriate conditions, sequential breakage processes often yield a lognormal distribution of particle sizes. Of particular interest to ecologists is the observed variance of the logarithms of the sizes, which characterizes the evenness of an assembiage of species. We derive the first two moments for the logarithms of the sizes in terms of the underlying distribution used to determine the successive breakages. In particular, for a process yielding n pieces, the expected sample variance behaves asymptotically as n log(n). These results also yield a new identity for moments of path lengths in random binary trees. Author (GRA)

N82-28115# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON SUBSET SELECTION PROCEDURES FOR INVERSE GAUSSIAN POPULATIONS
Shanti S. Gupta and Hwa-Ming Yang Mar. 1982 25 p refs
(Contract N00014-75-C-0455)
(AD-A113965; TR-82-7) Avail: NTIS HC A02/MF A01 CSCL 12/1

The inverse Gaussian or the first passage time probability distribution for Brownian motion with a drift is particularly important for modeling and interpreting observed distributions of time intervals in many different fields of research. In this paper we deal with the problem of selecting a subset of k inverse Gaussian populations which includes the 'best' population, i.e. the (unknown) population which is associated with the largest value of the unknown means. The shape parameters of the inverse Gaussian distributions are assumed to be equal for all the k populations. When the common shape parameter is known, a procedure R1 is defined and studied which selects a subset which is nonempty, small in size and just large enough to guarantee that it includes the best population with a preassigned probability regardless of the true unknown values of the means. For the case when the common shape parameter is unknown a procedure R2 is proposed. For the procedures R1 and R2, we obtain exact results for $k = 2$ concerning the infimum of the probability of a correct selection. For $K > or = 3$ a lower bound on the probability of a correct selection is derived for each case. Formulas for the constants d1 and d2 which are necessary to carry out the procedures R1 and R2, respectively, are obtained. An upper bound on the expected number of populations retained in the selected subset is given. GRA

N82-28116# Stanford Univ., Calif. Dept. of Statistics.
MOMENT EXPANSIONS FOR ROBUST STATISTICS
Keaven Martin Anderson 12 Mar. 1982 81 p refs
(Contract DAAG29-79-C-0166)
(AD-A114048; TR-7; ARO-16668.5-M) Avail: NTIS HC A05/MF A01 CSCL 12/1

Our objective is to give asymptotic expansions for moments of standardized statistics based on n independent, identically distributed random variables as n approaches infinity. The basic premise is that a simple tail condition on the underlying distribution which implies the moments of a standardized quantile converge to the moments of an appropriate normal distribution is sufficient to assure the validity of asymptotic moment expansions for many statistics which are resistant to

ouliers. The primary result we present gives sufficient conditions for the validity of moment approximations based on moments of Taylor's series approximations which are obtained by using functional differentiation. We apply the theory to some L- and M-estimates and present a Monte Carlo study to show that the approximations for the variance of statistics based on small to moderate sample sizes can be quite good. Prior to studying the above general problem we consider the problem of the convergence of the moments of a standardized quantile to those of an appropriate normal distribution. Our proof of moment convergence requires fewer non-tail conditions on the underlying distribution than were used in previously published results. We also extend the result to show necessary and sufficient tail conditions on the underlying distribution for convergence of the moment generating function of a standardized quantile to that of a normal distribution. Author (GRA)

N82-28117# Princeton Univ., N. J. Dept. of Statistics.
POST-CONFIGURAL POLYSAMPLING PUSHBACK PERFORMANCE
Katerine Bell Krystinik Feb. 1982 20 p refs
(Contract DAAG29-79-C-0205)
(AD-A113778; ARO-16669.14-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

The pushback estimates are a preliminary data modification followed by the application of a robust statistic to the modified data. Application of configural polysampling techniques and use of the minimum attainable variance and maximum attainable polyefficiency derived from these techniques aid in fine-tuning the pushback estimates. The form of the pushback estimate shown by traditional Monte Carlo methods to perform well in comparison to a good biweight is modified and the performance is improved. Author (GRA)

N82-28118# Ohio State Univ., Columbus. Dept. of Statistics.
STRONGER TESTS USING HETEROSCEDASTIC ANOVA WITH A SIMULATION OF MULTIPLE OBJECTIVE BUDGETING CASE STUDY
Edward J. Dudewicz and W. Thomas Lin (Univ. of Southern California, Los Angeles) Mar. 1982 18 p refs
(Contract N00014-78-C-0543)
(AD-A113426; TR-250A) Avail: NTIS HC A02/MF A01 CSCL 05/3

The traditional analysis of variance (ANOVA) is based on the assumptions of normality, independence of the statistical errors, and equality of the variances of the errors. Studies of the robustness of the F-test have shown that the violation of normality has little effect on inferences about the means. However, the violation of independence or equality of variances can have a serious effect on inferences about the means, especially if the cell sample sizes are unequal (see, for example, Scheffe (1959) or Bishop (1976). In practice, the assumption of equality of error variances seems to be often unjustified; in fact, even when the error variances are equal, the power of the F-test depends upon the unknown common variance, which renders it difficult to plan an experiment rationally. Recently, Bishop and Dudewicz (1978), (1981) developed new ANOVA procedures in the contexts of the one-way layout and higher-way layouts. Their procedures allow unequal and unknown population variances and give tests with level and power completely independent of the unknown variances. Briefly outlined is the two-way layout heteroscedastic-ANOVA (HANOVA) methodology. It is followed by case study of Lin's (1978) multiple objective firm simulation for the two-way layout ANOVA procedure. Finally, the conclusion and other possible business applications are outlined. GRA

N82-28119# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
STOCHASTIC MODELING: IDEAS AND TECHNIQUES
Donald P. Gaver Jan. 1982 85 p refs
(RR-140501)
(AD-A113847; NPS55-82-005) Avail: NTIS HC A05/MF A01 CSCL 12/1

This report summarizes the contents of lectures given on probability modeling and reports some new results on the availability of inspected systems of redundant systems in random environments, and on 'sculptured distributions'. Author (GRA)

N82-28120# Clemson Univ., S.C. Dept. of Mathematical Sciences.
AN EMPIRICAL BAYES ESTIMATE OF MULTINOMIAL PROBABILITIES
Khursheed Alam and Amitava Mitra Feb. 1982 14 p refs
Prepared in cooperation with Auburn Univ.
(Contract N00014-75-C-0451)
(AD-A112920; TR-381; N137) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper deals with the problem of estimating simultaneously the parameters (cell probabilities) of m = or > 2 independent multinomial distributions, with respect to a quadratic loss function. An empirical Bayes estimator is given which is shown to have smaller risk than the maximum likelihood estimator for sufficiently large value of m, at all points of the parameter space outside its boundary. Author (GRA)

N82-28121# Clemson Univ., S.C. Dept. of Mathematical Sciences.
A BAYES RULE FOR SELECTING THE LARGEST COMPONENT
Khursheed Alam 16 Jul. 1981 14 p refs
(Contract N00014-75-C-0451)
(AD-A112946; N127; TR-365) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X subscript bar = (X subscript 1,...,X subscript k) be a random vector whose distribution depends on an unknown vector parameter theta subscript bar = (theta subscript 1, theta subscript k). The marginal distribution of X subscript i depends on theta subscript i only, i = 1,...,k. This paper deals with the problem of selecting the largest component of theta subscript bar and the analogous problem of selecting a subset of the components of theta subscript bar which includes the largest component. We consider the selection problem in a general decision theoretic framework and derive Bayes rules for selecting the largest component. The Bayes rules are shown to have certain optimal properties. The ordinary selection rules are shown to be Bayes rules, with respect to a special loss function. Author (GRA)

N82-28122# Clemson Univ., S.C. Dept. of Mathematical Sciences.
A BAYES PROCEDURE FOR SELECTING THE POPULATION WITH THE LARGEST pth QUANTILE
Khursheed Alam Jul. 1981 16 p refs
(Contract N00014-75-C-0451)
(AD-A112947; N130; TR-368) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Bayesian approach has not been very fruitful in treating nonparametric statistical problems, due to the difficulty in finding mathematically tractable prior distributions on a set of probability measures. The theory of the Dirichlet process has been developed recently. The process generates randomly a family of probability distributions which can be taken as a family of prior distributions for the Bayesian analysis of some nonparametric statistical problems. This paper deals with the problem of selection a distribution with the largest pth quantile value, from k > or = 2 given distributions. It is assumed a priori that the given distributions have been generated from a Dirichlet process. GRA

N82-28123# Clemson Univ., S.C. Dept. of Mathematical Sciences.
BASKET METHOD FOR SELECTING BALANCED SAMPLES. PART 3: COMPUTER SOURCE PROGRAMS
K. T. Wallenius and Stephen L. Benz Nov. 1981 60 p
(Contract N00014-75-C-0451; NR Proj. 365-049)
(AD-A113044; N134) Avail: NTIS HC A04/MF A01 CSCL 09/2

In this third of a series of three documents describing the basket method of sampling, source computer codes are provided for the convenience of users who may want to modify the programs to meet special local needs. Author (GRA)

N82-28124# Clemson Univ., S.C. Dept. of Mathematical Science.
A FINITE URN MODEL FOR SELECTING THE PROPULSION WITH THE LARGEST ALPHA-QUANTILE
Khursheed Alam and M. Haseeb Rizvi Jan. 1982 12 p refs

(Contract N00014-75-C-0451; NR Proj. 365-049)
(AD-A113060; TR-378; N-136) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several procedures for ranking populations according to the quantile of a given order have been discussed in the literature. These procedures deal with continuous distributions. This paper deals with the problem of selecting a population with the largest alpha-quantile from k > or = 2 finite populations, where the size of each population is known. A selection rule is given based on the sample quantiles, where the samples are drawn without replacement. A formula for the minimum probability of a correct selection for the given rule, for a certain configuration of the population alpha-quantiles, is given in terms of the sample numbers. Author (GRA)

N82-28125# Maryland Univ., College Park. Computer Vision Lab.

GENERALIZED BLOMQVIST CORRELATION: A NEW U STATISTIC AND SOME EXAMPLES

Stanley M. Dunn Nov. 1981 23 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A113015; TR-1125; AFOSR-82-0268TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Generalized Blomqvist Correlation, a generalization of the double median test, is first formulated as a new U statistic with a lower variance. Several open questions are answered, and some examples are given. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-28126 Sheffield Univ. (England). Dept. of Control Engineering.

PARAMETER ESTIMATION TECHNIQUES FOR NONLINEAR SYSTEMS

S. A. Billings and I. J. Leontaritis Mar. 1982 7 p refs Presented at 6th IFAC Symp. on Identification and System Parameter Estimation, Washington, D.C., June 1981
(RR-172) Avail: NTIS HC A02

The identification of nonlinear systems, using parameter estimation methods based on input-output models, is considered. A nonlinear difference equation representation for a wide class of nonlinear systems is introduced by considering the observability of nonlinear systems and extending the classical autoregressive moving average model to include polynomic terms. The effects of internal noise are investigated and modified recursive extended least squares and maximum likelihood algorithms are derived and shown to produce unbiased estimates in the presence of multiplicative noise. Author (ESA)

N82-28127# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

STRATEGIES USING INTERRUPTED OBSERVATIONS FOR HITTING A MOVING TARGET

Yaakov Yavin Aug. 1981 42 p refs Sponsored in part by Control Data
(CSIR-TWISK-221) HC A03/MF A01

Consider the random motion of two points M sub p and M sub e in the x sub 1 x sub 2-plane, with the veocity v = (v sub 1, v sub 2) of M sub p perturbed by an R(2)-valued Gaussian white noise, while point M sub 3, moving along a line in the plane through the origin, has instantaneous velocity f(x sub 3) where x sub 3 denotes the coordinate of m sub 3 along the line, and f(x sub 3) is also perturbed by an R-valued Gaussian white noise. The observations available to the point M sub p are given by y = z x + (1-z)x sub p, where x = (x sub 1, x sub 2, x sub 3), x sub p = (x sub 1,x sub 2), and [z(t), t > or = 0] is a homogeneous jump Markov process with state space S = [0,1]. Given also an open and bounded set A in the plane, the problem dealt with here is to find a velocity law (strategy) v* = v*(y) such that the probability that the point M sub p hits the point M sub 3 in A, before either point has left A, will be maximized on a given class of admissible strategies of the form v = v(y). Sufficient conditions on weak optimal strategies are derived. An algorithm for computing weak suboptimal strategies is suggested and these are computed for a variety of cases. M.G.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-28128# Maryland Univ., College Park. Interdisciplinary Applied Mathematics Program.

REPORT ON THE SPECIAL YEAR IN NUMERICAL ANALYSIS, 1980 - 1981 Final Report, 15 Aug. 1980 - 14 Aug. 1981

Ivo Babuska Dec. 1981 130 p refs
(Grant AF-AFOSR-0251-80; AF Proj. 2304)
(AD-A111241; AFOSR-82-0056TR) Avail: NTIS HC A07/MF A01 CSCL 12/1

Lectures addressing the progress, current problems, and future trends in numerical analysis are summarized. Special emphasis was given to the numerical solution of partial differential equations, global continuation methods, numerical methods in statistics, numerical linear algebra, and numerical problems associated with special functions. M.G.

N82-28129# Stanford Linear Accelerator Center, Calif.

MINIMAL RELATIVISTIC THREE-PARTICLE EQUATIONS

J. Lindesay Jul. 1981 61 p refs
(Contract DE-AC03-76SF-00515)
(DE82-003564; SU-SLAC-243) Avail: NTIS HC A04/MF A01

A minimal self-consistent set of covariant and unitary three-particle equations is presented. Numerical results are obtained for three-particle bound states, elastic scattering and rearrangement of bound pairs with a third particle, and amplitudes for breakup into states of three free particles. The mathematical form of the three-particle bound state equations is explored; constraints are set upon the range of eigenvalues and number of eigenstates of these one parameter equations. The behavior of the number of eigenstates as the two-body binding energy decreases to zero in a covariant context generalizes results previously obtained non-relativistically. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-28130# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

ELECTRIC DISCHARGE FLOW INTERACTION IN PARALLEL AND CROSS FLOW ELECTRIC FIELDS M.S. Thesis

John William Wainionpaa Sep. 1981 58 p refs
(AD-A112300) Avail: NTIS HC A04/MF A01 CSCL 20/3

This work deals with an evaluation of power capacity of two glow discharge orientations with respect to a flowing medium, namely, parallel and cross-flow. A test section was designed and fabricated to compare the effects of flow, turbulence generated by perforated plates, electrode spacing and electrode length on the cross-flow electric field to the performance of an existing parallel flow electrode set of the same type: positive pin-rack (anode) and plane (cathode). Discharge data and photographs are presented. Flow and turbulence are stabilizing. The parallel flow electric field discharge permits higher power than the cross-flow field. Increased cathode length in the streamwise direction produces a small detriment to discharge power. Author (GRA)

N82-28131# Naval Ship Research and Development Center, Annapolis, Md. Propulsion and Auxiliary Systems Dept.

STABILITY MEASUREMENTS OF ALUMINUM-STABILIZED NbTi AND BRONZE MATRIX Nb(3)Sn POTTED SUPERCONDUCTING MAGNETS

D. J. Waltman, M. J. Superczynski, and F. E. McDonald Mar.

1982 24 p refs
(AD-A114056; DTNSRDC/PAS-81/33) Avail: NTIS HC A02/MF A01 CSCL 20/12

Two epoxy-impregnated superconducting test coils, containing 0.635-centimeter electrical heaters imbedded in their windings, have been constructed to measure the minimum energy-to-quench as a function of operating current at various fixed levels of magnetic field strength. One test coil was wound with aluminum-stabilized NbTi superconducting wire and the other coil was wound with bronze matrix Nb3Sn superconducting wire. The results of the energy-to-quench measurements are presented for both these test coils, and these results are compared to the previous measurements made for copper-stabilized NbTi test coils. GRA

N82-28132# Maine Univ., Orono. Dept. of Physics and Astronomy.

CRITERION FOR FIRST-ORDER PHASE TRANSITIONS

P Kleban and Chin-Kun Hu Feb. 1982 14 p refs Submitted for publication
(Contract N00014-79-C-0441; NR Proj. 392-032)
(AD-A113049; TR-5) Avail: NTIS HC A02/MF A01 CSCL 12/1

We show, via scaling arguments, that a first order transition occurs when the appropriate susceptibility (second derivative of the free energy) diverges proportional to the volume of the system. This result holds rigorously as an equality or an upper bound for a very large class of Hamiltonians. The divergence is maximal; therefore, it provides a useful way of locating first order transitions. Our method gives accurate results for the two dimensional Ising model. Author (GRA)

N82-28133# Maryland Univ., College Park. Dept. of Mathematics.

GLOBAL NONEXISTENCE OF SMOOTH ELECTRIC INDUCTION FIELDS IN NONLINEAR DIELECTRICS. 1: INFINITE CYLINDRICAL DIELECTRICS

Frederick Bloom 29 Jan. 1982 47 p refs Prepared in cooperation with South Carolina Univ.
(Grant AF-AFOSR-0171-81; AF Proj. 2304)
(AD-A113023; MD82-1-FB; AFOSR-82-0265TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

Coupled nonlinear wave equations are derived for the evolution of the components of the electric induction field equivalent D in a class of rigid nonlinear dielectrics governed by the nonlinear constitutive relation equivalent E = Lambda (d) equivalent D, where equivalent E is the electric field and Lambda > 0 is a scalar-valued vector function. For the special case of an infinite one-dimensional dielectric rod, embedded in a perfect conductor, it is shown that, under relatively mild conditions on Lambda, solutions of the corresponding initial-boundary value problem for the electric induction field cannot exist globally in time in L2 sense if it is assumed that the electric field in the rod is perpendicular to the axis of the rod and varies as the coordinate along that axis. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-28134*# Stanford Univ., Calif. Joint Inst. for Aeronautics and Acoustics.

THE ANNOYANCE OF IMPULSIVE HELICOPTER NOISE Final Report, Jan. - Dec. 1981

K. Karamcheti Dec. 1981 27 p refs
(Grant NAG1-17)
(NASA-CR-169123; NAS 1.26:169123) Avail: NTIS HC A03/MF A01 CSCL 20A

A total of 96 impulsive and non-impulsive sounds were rated for annoyance by 10 subjects. The signals had the same amplitude spectrum with a maximum frequency of 4.75 kHz. By changing the phase of the spectral components different levels of impulsivity were obtained. The signals had coefficients of impulsivity of 10.8, 7.9, and -0.2 respectively. Further, signals had intensity levels 89 and 95 dBA, pulse repetition rates 10 and 20 Hz, and half the signals had pink noise added at a level 12 dBA lower than the level of the sound. The significant results were: The four females and six male subjects rated the impulsive sounds respectively 3.7 dB less annoying and 2.6 dB more annoying than the non-impulsive sounds. Overall, impulsivity had no effect. The hish pulse repetition rate increased annoyance by 2.2 dB. Addition of pink noise increased annoyance of the non-impulsive sounds 1.2 dB, but decreased the annoyance of the impulsive sounds 0.5 dB. T.M.

N82-28135# Pennsylvania State Univ., University Park. Applied Research Lab.

DIFFRACTION EFFECTS OF APERTURES IN THE EXTREME NEARFIELD M.S. Thesis

Robert L. Ochs, Jr. 12 Feb. 1982 88 p refs
(Contract N00024-79-C-6043)
(AD-A113903; ARL/PSU/TM-82-70) Avail: NTIS HC A05/MF A01 CSCL 07/4

A model is developed that describes, at least qualitatively, the sound field within a wavelength of an aperture in an opaque, plane screen insonified by harmonic waves. The normal component of the particle velocity is assumed to be the same in the aperture as if no screen were present and zero everywhere else in the plane of the screen. Using this assumption, an expression for the transmitted sound field is developed in the form of the inverse Fourier transform of the product of the Fourier transform of the normal component of the particle velocity in the plane of the screen and the Fourier transform of the Green function appropriate for Neumann boundary conditions on a plane. This expression can be evaluated quickly using a fast-Fourier-transform (FFT) algorithm. The validity of the above assumption is demonstrated in the extreme nearfield by comparison with experiment for the case of a diffraction grating of straight strips separated by a distance less than a wavelength and insonified by plane waves. The model is then used to study the diffraction of cylindrical waves by a grating of straight strips. A rapid method of calculating exactly the sound field of an oscillating piston of arbitrary configuration in a rigid baffle is also indicated. GRA

N82-28136# Georgetown Univ., Washington, D.C. Dept. of Physics.

LINEAR AND NONLINEAR ULTRASONIC INTERACTIONS ON LIQUID SOLID BOUNDARIES Summary Report, Sep. 1978 - Mar. 1982

Walter G. Mayer Apr. 1982 7 p refs
(Contract N00014-78-C-0584; NR Proj. 384-928)
(AD-A113682; GUUS-0482-Su) Avail: NTIS HC A02/MF A01 CSCL 20/1

Tasks performed and all publications originating from the contract during reporting period are listed. The main emphasis was placed on reflection and transmission of a bounded ultrasonic beam since it found that plane wave theory (as almost always used in the past) does not explain the existence of nonspecular ultrasonic reflection from interfaces, where 'nonspecular reflection' refers to beam displacements, beam split-up, intensity distribution changes within the reflected beam, and other similar phenomena. Such nonspecular reflections occur for simple liquid-solid interfaces when the incident beam impinges at the Rayleigh angle and, for solid plates immersed in a liquid, at Lamb mode angles. GRA

N82-28137# Lowell Univ., Mass. Center for Atmospheric Research.

RESEARCH ON THE INVERSE PROBLEM OF SCATTERING Final Report, 1 Oct. 1976 - 30 Sep. 1981

Harry E. Moses Oct. 1981 10 p
(Grant AF-AFOSR-3169-77; AF Proj. 2304)
(AD-A113868; ULRF-416/CAR; AFOSR-82-0299TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Initially our principal concern was to obtain a better understanding of the fundamental ideas of inverse scattering and spectral theory, particularly in one dimension where the principal mechanism for obtaining potentials from spectral data, namely the Gelfand-Levitan, was well established. As we became more adept at solving inverse problems explicitly for certain kinds of spectral data, we were able to provide interesting examples and counter-example for conjectured theorems. Thus we were able to show that scattering data generally does not tell one whether

a scattering potential is local or, if it is local, gives it uniquely without prior knowledge of the range of the potential. As is well-known, there is a dearth of scattering potentials, even for the one-dimensional and radial Schroedinger equations, for which the Schroedinger equation can be solved in terms of elementary functions. We have provided many new solvable potentials. GRA

N82-28138# Arizona Univ., Tucson. Dept. of Chemistry.
THEORY AND EVALUATION OF A WINDOWLESS NON-RESONANT OPTOACOUSTIC CELL Interim Report
Scott B. Tilden and M. Bonner Denton 1 Dec. 1981 24 p refs
(Contract N00014-75-C-0513; NR Proj. 051-549)
(AD-A113471; TR-30) Avail: NTIS HC A02/MF A01 CSCL 20/6

A novel non-resonant flow-through optoacoustic cell is characterized. This cell is operated without windows, completely eliminating the window background interference. Data are presented comparing sensitivity, resistance to cross-contamination, and operating characteristics of this approach with more conventional single and differential cell techniques. The capability of operation at widely varying sample flow rates is demonstrated. Author (GRA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-28139# Polish Academy of Sciences, Warsaw. Pracownia Fizyki Polimerow.
NUCLEATION OF PHASE TRANSITIONS IN SYSTEMS OF ASYMMETRIC PARTICLES
Andrzej Ziabicki and Leszek Jarecki 1982 74 p refs
(Grant NSF INT-76-17522)
(ISSN-0208-5658) Avail: NTIS HC A04/MF A01

The physical sense of the basic parameters of nucleation theory are reexamined with reference to the fundamentals of phenomenological and statistical thermodynamics. Topics covered include: the discrete theory of nucleation in dilute systems of symmetric particles; orientable particles and the effects of their orientation on nucleation kinetics and thermodynamics; the orientation distribution of crystals vs. amorphous elements; and eqilibrium concentration in cluster growth reactions and the chemical potential of cluster growth. A.R.H.

N82-28140# Air Force Academy, Colo. Molecular Dynamics Div.
MNDO-ESTIMATIONS OF THE STANDARD ENTHALPY OF FORMATION OF SOME BINARY SULFUR-NITROGEN COMPOUNDS AND THEIR DERIVATIVES
S. Sensarma (Detroit Univ.), A. G. Turner (Detroit Univ.), M. J. DeLong, and L. P. Davis Feb. 1982 13 p refs
(AF Proj. 2303)
(AD-A111153; FJSRL-TR-82-0001) Avail: NTIS HC A02/MF A01 CSCL 20/8

A table of standard enthalpies of formation of all known binary compounds of sulfur and nitrogen has been compiled from a large number of MNDO type molecular orbital calculations. Author (GRA)

N82-28141# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va.
FUNDAMENTALS OF ION MOTION IN ELECTRIC RADIO-FREQUENCY MULTIPOLE FIELDS Final Report, period ending Apr. 1981
M. H. Friedman, A. L. Yergey, J. E. Campana, and L. Kelner Jul. 1981 42 p refs
(AD-A107243; MERADCOM-2332) Avail: NTIS HC A03/MF A01 CSCL 14/2

The fundamentals of ion motion in electromagnetic fields are reviewed in detail with a special emphasis on electric radiofrequency (RF) fields which are used frequently in dynamic mass spectrometry. Forces and effects on ions in electromagnetic fields which are typically neglected, but which may be important in practical applications, are reviewed and discussed for completeness. A method based on complex variable theory is developed for finding the potential function of 'ideal multiplole electromagnetic fields.' Application of this method for the determination of potential functions and differential equations of ion motion is demonstrated with reference to the electric radiofrequeny dipole, quadrupole, hexapole, octapole, and decapole fields. The results and implications of this preliminary communication and tutorial are of importance in ion physics and dynamic mass spectrometry. Author (GRA)

N82-28142# Air Force Geophysics Lab., Hanscom AFB, Mass.
A DATA ACQUISITION AND INSTRUMENT CONTROL SYSTEM FOR LABORATORY TESTS OF AN ION BEAM SOURCE Interim Scientific Report
Kirk Broomhead (Boston College), Allen Chesley, and Ronald Boucher (Bedford Research Associates) 17 Sep. 1981 34 p
(AF Proj. 7661)
(AD-A112340; AFGL-TR-81-0264; AFGL-IP-305) Avail: NTIS HC A03/MF A01 CSCL 20/7

During the 1970's, the Air Force developed an ion beam source for use in spacecraft discharging experiments. In addition to the flight instruments, several models were developed for laboratory tests conducted at the Air Force Geophysics Laboratory. Over the past several years, the research methods used for the Satellite Positive Ion Beam System (SPIBS) tests have evolved from manual techniques for experiment control and data recording to the present use of a real-time, computer-based system. Author (GRA)

N82-28143# United Technologies Research Center, East Hartford, Conn.
THEORETICAL RESEARCH INVESTIGATION FOR AIR MOLECULAR CALCULATIONS Final Report, 15 Sep. 1980 - 15 Mar. 1981
H. Harvey Michels 15 Apr. 1981 93 p refs
(Contract F19628-80-C-0209; AF Proj. D411)
(AD-A112286; AFGL-TR-81-0151) Avail: NTIS HC A05/MF A01 CSCL 12/1

The reaction rate of the ion-molecule reaction O(+) + N2 yields NO(+) N has been calculated using quantum mechanical methods. This reaction is important in both the nuclear disturbed and natural ionospheres, since it is major route for formation of NO(+). The detailed state-to-state cross-sections for this reaction have been calculated as a function of the kinetic energy of the collision and of the vibrational state of nitrogen in its ground electronic state. The energy range used was 0.1 to 10 eV. An examination of the potential energy hypersurfaces involved led to use of the lowest 4 A double prime hypersurface for the reaction. The cross-sections were then calculated using an R-matrix propagator technique. The calculations are in excellent agreement with experiment down to energies of about 0.2 eV, where other mechanisms become dominant. It has been found that increasing either the translational or vibrational energy results in a large increase in cross-section at low energies. Author (GRA)

N82-28144# Rome Air Development Center, Griffiss AFB, N.Y. Electro-Optical Device Technology Branch.
PHYSICS OF ATOMIC FREQUENCY STANDARDS BASED ON STIMULATED RESONANCE RAMAN SCATTERING
Richard H. Picard and Charles R. Willis (Boston Univ.) Oct. 1981 32 p refs
(AF Proj. 2305)
(AD-A112627; RADC-TR-81-310) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report analyzes a novel technique developed at RADC for high-precision frequency standards operating in the microwave to far infrared regions of the spectrum. The technique is based on stimulated resonance Raman scattering of visible laser light in atomic or molecular beams; it does not require low frequency (microwave to far infrared) radiation to interact with the resonant species, and it is potentially capable of stabilities characteristic of low-frequency atomic standards. GRA

N82-28145# United Technologies Research Center, East Hartford, Conn.
INVESTIGATION OF ELECTRON COLLISION PROCESSES

IN HgBr2 Final Report, 15 Feb. 1981 - 14 Apr. 1982
William L. Nighan, John J. Hinchen, and Walter J. Wiegand 14 Apr. 1982 50 p refs Submitted for publication
(Contract N00014-81-C-0253)
(AD-A113753; R82-525545-1) Avail: NTIS HC A03/MF A01 CSCL 20/7

Cross sections for mercuric bromide (HgBr2) dissociative attachment and ionization have been measured using an electron beam experiment. The dominant products of these reactions, as identified by mass analysis, are Br (-) and HgBr 2(+ 1). A complementary electron swarm experiment was used to determine the ion production coefficients in a variety of gas mixtures containing HgBr2. The measured ion production coefficients were found to be in excellent agreement with the attachment and ionization coefficients computed using the measured cross sections. Additionally, analysis of the variations in the measured HgBr2 ion production coefficients along with measured electron drift velocity variations is found to be consistent with the interpretation that vibrational excitation of HgBr2 is dominated by a resonance in the 3-5 eV electron energy range for which dissociative attachment is observed to occur. Author (GRA)

N82-28146# Florida Univ., Gainesville. Dept. of Physics.
COLLISIONS OF IONS IN GASES Final Report, Aug. 1975 - Feb. 1979
Thomas L. Bailey 31 Mar. 1982 20 p refs
(Contract N00014-76-C-0127)
(AD-A113580) Avail: NTIS HC A02/MF A01 CSCL 20/7

This report is a summary description of research carried out under the ONR Project 'Collisions of Ions in Gases'. The work consisted of experimental studies of collisions of low-energy ions (4 < or = E sub L < or = 500 eV) with atoms and molecules, using the ion-beam gas-target technique, and of theoretical and computational studies done in support of the experiments. Three types of experiments were carried out: (a) measurements of relative differential cross-sections for elastic and inelastic (i.e., charge transfer) scattering in collisions of the He(++) ions with Ne, Ar, and Kr atoms, over the ion energy range 8 < or = E sub L < or = 60 eV; (b) kinematical studies of charge transfer in collisions of 30 < or = E sub L < or = 373 eV Ne(+), Ar(+), and Kr(+) ions with H2, D2, O2, and N2 molecules, in which the KE-distributions of the product H2(+), etc., were measured; and (c) measurements of the absolute total cross-sections for the charge transfer process He(++) + R = He(+) + R(+), where R = Ne, Ar, Kr, over the energy range 4 < or = E sub L < or = 500 eV. The experimental results, and their interpretations in terms of appropriate quantum scattering theory (where the latter was feasible) are discussed briefly. The effects of the thermal motions of collision participants (i.e., thermal broadening) in ion-atom and similar scattering experiments were investigated in computational studies, and a new crossed ion-supersonic atom/molecule beams apparatus, designed to remove the thermal broadening effect and to give high resolution in energy and angle, is discussed. Author (GRA)

N82-28147# Battelle Columbus Labs., Ohio.
MULTIDIMENSIONAL MANY-BODY THEORY Final Technical Report, 15 Sep. 1979 - 15 Mar. 1982
Lynn T. Redmon 31 Mar. 1982 39 p refs
(Contract N00014-79-C-0821)
(AD-A113160) Avail: NTIS HC A03/MF A01 CSCL 20/10

This report, which includes three published papers as Appendices, summarizes the development of a theoretical foundation for the ab-initio calculation of potential energy surfaces for ground and excited states of molecular systems and the nonadiabatic coupling matrix elements between these states. The energies are obtained from an effective Hamiltonian, based on a canonical van Vleck formalism, for which a diagrammatric perturbative expansion is developed. A novel analogous diagrammatic expansion for the nonadiabatic couplings required for dynamical calculations is also presented. GRA

N82-28148# Arizona Univ., Tucson. Dept. of Chemistry.
THE ROLE OF OBSERVATION HEIGHT IN SOME INTERFERENCES REPORTED IN OIL ANALYSIS BY ATOMIC ABSORPTION Interim Report
J. D. Algeo and M. Bonner Denton 12 Feb. 1982 9 p refs Submitted for publication
(Contract N00014-75-C-0513; NR Proj. 051-549)
(AD-A113470; TR-29) Avail: NTIS HC A02/MF A01 CSCL 11/8

Reports have appeared which indicate that the type of organometallic complex used in the preparation of standards for the determination of metals in oil by atomic absorption spectrophotometry (AAS) can influence the sensitivity of the method. Because the type of complexes existing in a given oil sample may not be known, this represents a possible interference on the determination. Recent work has shown that similar interferences can exist in the inductively coupled plasma (ICP), if observations are carried out near the load coil. The interferences were not seen when observations were made high in the plasma discharge. The reported AAS interferences were observed very low in the flame, just above the burner. In contradiction to usual experience, the magnitudes of the reported interferences were greater in the nitrous oxide-acetylene flame than in the air-acetylene flame. Since observation height was found to affect the ICP results, an investigation of the role of observation height upon the reported interference on nickel absorption, as well as its effect on iron absorption was made. GRA

N82-28149# Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany).
BEHAVIOUR OF RAPIDLY ROTATING NUCLEI Ph.D. Thesis
S. Frauendorf Oct. 1980 86 p refs
(ZfK-409) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

The Hartree-Fock-Bogoljubob equations in the rotating frame (Cranking model) are used to describe the behavior of rapidly rotating nuclei. The rotation is expected to predominantly change the single particle motion, the pair correlations and the nuclear shape. The quasi-particle motion in a rotating potential is extensively discussed. The symmetry quantum numbers, parity and signature are used for the classification of the levels. The angular frequency plays a key role. Its experimental determination is discussed. The experimental excitation energy and angular momentum of the quasi-particles are defined. The experimental specra may be understood in terms of configurations of independent quasi-particles. The disappearance of pair configurations due to rotation is analyzed. The fluctuations of the pair field stabilize the correlations. The transition to the unpaired state consists of few jumps due to the break up of individual nucleon pairs. The calculated nuclear shape remains approximately unchanged in a large interval of angular momentum. At high momenta it jumps to larger deformation. This reflects how the shell structure influences the deformation energy. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-28150# Johnson (E. R.) Associates, Inc., Reston, Va.
PRELIMINARY ASSESSMENT OF ALTERNATIVE DRY STORAGE METHODS FOR THE STORAGE OF COMMERCIAL SPENT NUCLEAR FUEL
Nov. 1981 230 p refs
(Contract DE-AC09-80ET-47929)
(DE82-002303; DOE/ET-47929/1) Avail: NTIS HC A11/MF A01

The results are presented for an assessment of the (1) state of technology, (2) licensability, (3) implementation schedule, and (4) costs of alternative dry methods for storage of spent fuel at a reactor location when used to supplement reactor pool storage facilities. The methods of storage that was considered included storage in casks, drywells, concrete silos and air-cooled vaults. The impact of disassembly of spent fuel and storage of consolidated fuel rods was also determined. The economic assessments were made based on the current projected storage requirements of Virginia Electric and Power Company's Surry Station for the period 1985 to 2009, which has two operating

pressurized water reactors (824 MWe each). It was estimated that the unit cost for storage of spent fuel in casks would amount to $117/kgU and that such costs for storage in drywells would amount to $137/kgU. However, based on the overall assessment it was concluded both storage methods were equal in merit. Modular methods of storage were generally found to be more economic than those requiring all or most of the facilities to be constructed prior to commencement of storage operations. DOE

N82-28151# California Univ., Livermore. Lawrence Livermore Lab.

MECHANICAL AND THERMOMECHANICAL CALCULATIONS RELATED TO THE STORAGE OF SPENT NUCLEAR-FUEL ASSEMBLIES IN GRANITE

T. R. Butkovich Aug. 1981 19 p refs

(Contract W-7405-eng-48)

(DE82-002945; UCRL-52985-Rev-1) Avail: NTIS HC A02/MF A01

A generic test of the geologic storage of spent-fuel assemblies from an operating nuclear reactor is being made by the Lawrence Livermore National Laboratory at the US Department of Energy's Nevada Test Site. The spent-fuel assemblies were emplaced at a depth of 420 m (1370 ft) below the surface in a typical granite and will be retrieved at a later time. The early time, close-in thermal history of this type of repository is being simulated with spent-fuel and electrically heated canisters in a central drift, with auxiliary heaters in two parallel side drifts. Prior to emplacement of the spent-fuel canistrs, preliminary calculations were made using a pair of existing finite-element codes. Calculational modeling of a spent-fuel repository requires a code with a multiple capability. The effects of both the mining operation and the thermal load on the existing stress fields and the resultant displacements of the rock around the repository must be calculated. The thermal loading for each point in the rock is affected by heat transfer through conduction, radiation, and normal convection, as well as by ventilation of the drifts. Both the ADINA stress code and the compatible ADINAT heat-flow code were used to perform the calculations because they satisfied the requirements of this project. ADINAT was adapted to calculate radiative and convective heat transfer across the drifts and to model the effects of ventilation in the drifts, while the existing isotropic elastic model was used with the ADINA code. The results of the calculation are intended to provide a base with which to compare temperature, stress, and displacement data taken during the planned 5-y duration of the test. In this way, it will be possible to determine how the existing jointing in the rock influences the results as compared with a homogeneous, isotropic rock mass. Later, new models will be introduced into ADINA to account for the effects of jointing. DOE

74 OPTICS

Includes light phenomena.

N82-28152# Texas Univ., Austin. Dept. of Electrical Engineering.

NEW NONLINEAR OPTICAL PROCESSES IN MOLECULES AT INFRARED FREQUENCIES Final Report, 30 Sep. 1978 - 31 Dec. 1981

Michael F. Becker 15 Feb. 1982 19 p

(Contract AF-AFOSR-3712-78; AF Proj. 2301)

(AD-A113779; AFOSR-82-0308TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

This final report details progress in the study of optical nonlinearities in molecules at infrared wavelengths. The objectives have been to investigate the nonlinear optical properties of triply resonant and two photon or Raman resonant molecules. The techniques of third harmonic generation, multiphoton absorption, and degenerate four wave mixing have been used, with a CO2 TEA laser as the excitation source. An outstanding accomplishment has been the successful application of third harmonic generation techniques to study collisionless multiphoton excitation in sulfur hexafluoride. Depending on the excitation frequency, one or two-photon processes have been identified which deplete the population of the discrete vibrational energy levels into the quasi-continuum. Similar third harmonic generation experiments have yielded lower conversion efficiency in ammonia than in sulfur hexafluoride. Only a single rotational level in ammonia is found to be resonant, so the susceptibility is only minimally enhanced. A second area of work is the study of the two photon Raman resonant molecule CD4. Third harmonic generation results were obtained for CD4 at room and cryogenic temperatures. Problems of fundamental wavelength absorption were eliminated and the nonlinearity was enhanced at 193K. GRA

N82-28153# Lincoln Lab., Mass. Inst. of Tech., Lexington. Electronic Systems Div.

GEOMETRY OF EARTHSHINE REFLECTION FROM A SPHERICAL TARGET

Michael P. Jordan 29 Jan. 1982 31 p

(Contract F19628-80-C-0002)

(AD-A112446; TR-597; ESD-TR-81-360) Avail: NTIS HC A03/MF A01 CSCL 17/5

An expression is found for the flux due to earthshine incident at any point on a spherical target as a function of target height above ground. Curves showing the variation of reflected signature (or view factor) with observer position and target height are presented for the case of a diffuse target surface. An expression is given for the view factor in the specular case, which is shown to be independent of observer position. Author (GRA)

N82-28154# BDM Corp., Albuquerque, N. Mex.

EVALUATION OF SPATIAL FILTERING AS A MEANS FOR INCREASING OPTICAL PERFORMANCE IN HIGH POWER BEAM TRAINS Final Technical Report

Carl Wiggins, George Lawrence, Lyn Skolnik, and John Corcoran 16 Sep. 1981 76 p

(Contract MDA903-80-C-0339)

(AD-A107164; BDM/A-81-605-TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

This report consists of annotated vugraphs covering objectives of the subtask statement. The major results on the effectiveness of spatial filtering on highly nonuniform intensity distributions in high power laser beam trains should be of general interest to the optics community at large and will, upon proper authorization, be submitted for journal publication in the open literature. Author (GRA)

N82-28155# Electronics Research Lab., Adelaide (Australia).

RETROREFLECTIVE PHASE RETARDATION PRISMS

J. R. Venning Jun. 1981 48 p refs

(AD-A112220; ERL-0202-TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

A retroreflecting device with controlled phase retardation can be made by coating each reflecting surface of a porro prism with a single dielectric film. The amount of phase retardation is a function of the refractive index of the prism, the refractive index of the film and the film thickness. The retardation introduced can be readily controlled in the range of zero to pi radians using readily available materials. The materials used are not birefringent. Two phase retardation prisms have been made and evaluated. GRA

N82-28156# United Technologies Research Center, East Hartford, Conn.

DEVELOPMENT OF AN ELECTRONIC INTERFACE FOR A FIBER OPTIC INTERFEROMETRIC SENSOR Final Report, 14 Jul. 1980 - 14 May 1981

W. H. Glenn, H. Knickerbocker, and A. P. Weise May 1981 41 p

(Contract N00173-80-C-0275)

(AD-A107261; UTRC/R81-925261-14) Avail: NTIS HC A03/MF A01 CSCL 17/8

This report documents the design, fabrication, and testing of an electronic interface unit for a fiber optic interferometric sensor. The unit is a wide dynamic range, highly linear FM demodulator for the detection of low modulation index FM signals in the presence of large, low frequency interfering signals. Outputs to drive acousto-optic frequency shifters are provided. The report includes complete parts lists and schematic drawings for two units delivered to the sponsoring agency, Naval Research Laboratory. Author (GRA)

N82-28157# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
OPTICAL COMMUNICATION FOR INTEGRATED CIRCUITS Final Report, 1 Jun. - 15 Nov. 1980
P. D. Dapkus Mar. 1982 111 p refs
(Contract N00014-80-C-0501)
(AD-A112239; MRDC41072.1FR) Avail: NTIS HC A06/MF A01 CSCL 20/6

This report summarizes a study of the feasibility of interconnecting high speed GaAs integrated circuits by the transmission of optical energy. Data rates in excess of 2 Gb/s will require an interconnect technology other than hardwire. The monolithic integration of optical devices with electronic circuitry makes high-data-rate optical data transmission possible. This study examined the requirements on lasers, laser drivers, detectors, preamplifiers, and optical distribution networks to make data transmission between IC chips feasible. These requirements have led to the selection of certain device designs and optical distribution networks for use in optical interconnect. To assess the performance of an optically interconnected system, such issues as power dissipation, optical losses, and geometrical size were assessed for each configuration. GRA

N82-28158# Honeywell Electro-Optics Center, Lexington, Mass.
WIDE DYNAMIC RANGE FLIR Final Report, Apr. - Dec. 1981
Wright-Patterson AFB, Ohio AFWAL Dec. 1981 41 p
(Contract F33615-81-C-1493; AF Proj. 2740)
(AD-A113631; AFWAL-TR-81-1251) Avail: NTIS HC A03/MF A01 CSCL 17/5

The Avionics Laboratory Chaparral type FLIR has been modified to become a wide dynamic range (greater than 65 dB), calibrated FLIR. To accomplish this, a field stop with known temperature references was added to the optics, and the preamplifiers were replaced with new, wide dynamic range preamplifiers. These modifications as well as a few other minor modifications that were required are described. The acceptance test results are also included. Author (GRA)

N82-28159# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
MULTICHANNEL OPTICAL DETECTION SYSTEM Final Technical Report, 15 May - 15 Dec. 1981
Gary L. Switzer Wright-Patterson AFB, Ohio AFWAL Mar. 1982 40 p refs
(Contract F33615-81-C-2047; AF Proj. 2301)
(AD-A113774; SRL-3869; AFWAL-TR-82-2030) Avail: NTIS HC A03/MF A01 CSCL 17/8

A multichannel optical detection system (MODS) for use in the detection of spectral information contained within a short pulsed light event has been developed. The system is based upon a technique which employs a series of fiber-optic waveguides to separate temporally the various spectral components of a light pulse, thus allowing spectral information to be detected by one (or a relatively small number of) photomultiplier tube(s) (PMT). The impetus for development of this technique was the prospect of a cost-effective multichannel optical detector having the speed, sensitivity, range, and other advantages inherent in photomultiplier detection. A small-scale version of this system consisting of 12 discrete channels has been assembled and operated. This 12-channel prototype was used to demonstrate the feasibility of the detection-system concept. Knowledge gained in the development of this system has been applied to the design of a practical-scale system consisting of 100 separate channels. GRA

N82-28160# Cambridge Univ. (England). Dept. of Physics and Chemistry of Solids.
LIQUID IMPACT EROSION MECHANISMS IN TRANSPARENT MATERIALS Interim Report, 30 Sep. 1980 - 30 Sep. 1981
S. vanDerZwaag and J. E. Field Wright-Patterson AFB, Ohio AFWAL Mar. 1982 57 p refs
(Grant AF-AFOSR-3705-78; AF Proj. 2422)
(AD-A114018; AFWAL-TR-82-4022) Avail: NTIS HC A04/MF A01 CSCL 17/5

This project has been concerned with developing techniques for the study of liquid impact, with studying the behaviour of various infra-red transparent solids and with analytic work on hard coatings. Damage has been assessed quantitatively by measuring the 'residual' strength after impact and plotting strength against velocity. Section 2 of this report describes an analysis of residual strength curves. The comparison between the analytic predictions and the experimental curves is good. Sections 3 and 4 describe the results of finite element analysis for the case of (1) Hertzian and (2) uniform pressure loading of substrates with a hard coating. The protection offered by the coating is examined in terms of the elastic properties of the coating and its thickness. Author (GRA)

N82-28161# Colorado Univ., Boulder. Dept. of Electrical Engineering.
CHARACTERISTICS OF SINGLE- AND MULTI-MODE OPTICAL WAVEGUIDES Final Report, 1 Sep. 1978 - 31 Dec. 1981
David C. Chang Apr. 1982 10 p refs
(Grant DAAG29-78-G-0173)
(AD-A113872; SR-71; ARO-15632.6-EL) Avail: NTIS HC A02/MF A01 CSCL 20/6

The results of investigations into the properties of single-mode and multimode optical waveguides are summarized. Specific results include propagation constants for fibers of arbitrary cross-section; an experimental study of tapers, truncations and offsets in slab waveguides; the effects of curvature on channel waveguides embedded in layered substrates; a new method for efficient computation of beams propagation in multimode waveguides; and investigation of mode coupling between multimode waveguides. Author (GRA)

N82-28162# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
ATTENUATION AND SCATTERING OF LIGHT IN OPTICAL FIBERS EFFECTS OF NUCLEAR RADIATION. MODULATION AND DISPLAY OF LASER RADIATION Final Technical Report, 1 May 1977 - 30 Apr. 1980
Shashanka S. Mitra Griffiss AFB, N.Y. RADC Dec. 1981 95 p refs
(Contract FD19628-77-C-0109; AF Proj. 2306)
(AD-A113174; RADC-TR-81-353) Avail: NTIS HC A05/MF A01 CSCL 20/6

This study consists of measurements of effects of nuclear radiation on attenuation and pulse dispersion and light scattering in optical fibers. The radiation induced attenuation in a number of optical fibers was evaluated. Several different types of fibers were exposed to steady state nuclear radiation and the resulting decrease in transmitted power was monitored as a function of wavelength and radiation dose. The wavelengths examined were in the visible and near IR regions that are of specific interest for optical fiber communications. The fibers showed a decrease in transmitted power at all wavelengths examined. The radiation sensitivity in glass core fibers was observed to show dependence on factors such as impurity content and the index modifying dopants in the fiber. Experimental measurements of neutron radiation induced pulse dispersion changes, and attenuation changes in a 100 micron core step index fiber were made. In the course of irradiation pulse dispersion in the fiber was observed to decrease while the attenuation increased. Results indicate greater decreases in the transmission of higher order modes. This reflects the fact that the radiation response of a fiber is determined by the respective refractive indices and absorption coefficients of both the core and cladding of the fiber. Results are presented along with a discussion of mechanisms by which dispersion changes can occur in irradiated fibers. GRA

N82-28163# Rochester Univ., N. Y. Inst. of Optics.
OPTICAL SYSTEMS AND STATISTICAL OPTICS Annual Technical Report, 1 Oct. 1980 - 1 Oct. 1981
Nicholas George Feb. 1982 76 p refs
(Grant AF-AFOSR-3434-77; AF Proj. 2305)
(AD-A113026; AFOSR-82-0209TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

Theoretical and experimental research is being conducted in the field of opto-electronic systems. The goal is to contribute solutions to problems of basic research importance which also have an underlying significance in practical applications that involve automatic pattern recognition and remote sensing. Excellent progress is reported on our study of image recognition

in white light illumination. We on our study of image recognition in white light illumination. We are studying a new type of holographic frequency plane filter that operates over a broad spectrum in the visible. The concept of an achromatic Fourier transform system has also been reduced to practice in a variety of optical configurations. Secondly, a raytracing theory is being formulated for the analysis of sandwich-type holographic optical elements, and high quality elements are being fabricated. Related studies are reported on optical subtraction, optical metrology of fibers and machined surfaces, and the automatic assessment of image quality. Author (GRA)

N82-28164# Naval Underwater Systems Center, New London, Conn. Submarine Electro-Optics Div.

PREDICTION OF OPTICAL IMAGE QUALITY NEAR THE SEA SURFACE FROM METEOROLOGICAL MEASUREMENTS

F. S. Replogle, Jr. and C. W. Fairall 25 Jan. 1982 54 p refs (AD-A113894; NUSC-TM-821008) Avail: NTIS HC A04/MF A01 CSCL 14/5

This report presents a mechanism for calculation of the optical index structure constant from bulk meteorological measurements (air and water temperatures, wind speed, air humidity) made over the ocean. From this and a formulation of the near field optical propagation from an incoherent point source, the expected line spread function for near the sea surface lines of sight is calculated. Finally, three series of photographic line width observations, made during unstable, neutral, and stable atmospheric buoyancy conditions, are compared with line widths expected from the calculations. Mean values of observed results agree with the calculations within about 25% for conditions of strong atmospheric instability. Since comparisons were made over a variety of target ranges, wind speeds, and camera elevations, it is concluded that the formulations derived are accurate to at least + or - 25% for conditions of strong atmospheric instability. The observations made under conditions of neutral and stable atmospheric buoyancy were instrumentally limited to an angular subtense of 2 to 4 arc seconds. These measured line width values fall between 1.9 and 0.6 times the values computed from meteorological measurements. The variability of image spreading observed across the target fields points out the difficulty of employing a single mechanism for correction of atmospherically induced image smear. Author (GRA)

N82-28165# Victoria Univ. (British Columbia). Dept. of Physics.

BEAM OPTICAL PROPERTIES OF THE MAGNETIC FIELD PRODUCED BY TWO COAXIAL COILS

D. E. Lobb Oct. 1980 24 p refs (TRI-PP-80-31) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The beam optical properties of channels consisting of two coaxial coils are presented for various ratios of total currents in the two coils and for various source locations. For the purpose of irradiating a volume of specified depth, it is shown that an axial line source produces a concentration of trajectories on axis throughout the volume. The role of energy loss and scatter of pions in a material medium for cones of rays converging onto a symmetry axis is examined, and it is shown that the energy loss per unit volume has a maximum near where the unscattered rays would intersect the axis. DOE

N82-28166# Zeiss (Carl), Oberkochen (West Germany).

GRADIENT INDEX GLASS IN OPTICAL SYSTEMS Final Report

Martin Krautter, Franz Muchel, and Erich Heynacher Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 39 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie (BMFT-FB-T-82-008; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,40

A computer program for ray tracing and optimization of rotationally symmetric optical systems was extended for media with a radial gradient index. Index profiles, according to a power series and to an exponential function, were provided for. In each of the photo-objectives with 5 lenses, an index gradient, according to a power function, was introduced in an element near the aperture stop. With this index gradient, the system was re-optimized. Improvements in image quality occur in the center and zone of the field, but not at the field edge. In microscope objectives, an index gradient according to an exponential function, was introduced at sections where the pencils of rays are separated. The index gradient improves the coma aberration. This is confirmed by an objective that was modified by a gradient index plate, following this design. Author (ESA)

N82-28167# Philips Zentrallaboratorium G.m.b.H., Hamburg (West Germany). Forschungslab.

MAGNETO-OPTIC PATTERN GENERATORS FOR ELECTROPHOTOGRAPHIC PRINTERS Final Report

Bernhard Hill and Klaus-Peter Schmidt Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie (BMFT-FB-T-82-014; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,75

The magneto-optic light switching technique and its feasibility for electronic reproduction of text or graphics by electrophotography were studies. An optical line-pattern generator to be used as electro-optic input device was constructed. Based on magneto-optic switching arrays, the best matching of spectral features, light output power other essential parameters with the electrophotographic process was investigated. The results of recording experiments with an optimized design of light source, imaging optics and light switching array used to expose organic photoconductors in a special electrophotographic test apparatus show the feasibility of the technique at medium recording speed. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-28168*# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.

THE LOWER-HYBRID-DRIFT INSTABILITY IN NON-ANTIPARALLEL REVERSED FIELD PLASMAS Interim Report

J. D. Huba, N. T. Gladd (JAYCOR, San Diego, Calif.), and J. F. Drake (Maryland Univ., College Park) 29 Oct. 1981 31 p refs Sponsored by NASA (RR0330244) (NASA-CR-168710; NAS 1.26:168710; AD-A107269; NRL-RR-4612) Avail: NTIS HC A03/MF A01 CSCL 04A

The lower-hybrid-drift instability is investigated in non-antiparallel reversed field plasmas, i.e., the magnetic fields on either side of a neutral line are not anti-parallel. Such a magnetic field configuration contains magnetic shear which has a stabilizing influence on the lower-hybrid-drift instability. It is found that magnetic shear has an inhibiting effect on the linear penetration of the lower-hybrid-drift mode toward the neutral line. The implications of this result to the reconnection processes in the magnetosphere (i.e., the nose and the magnetotail) are discussed. Author (GRA)

N82-28169# Nagoya Univ. (Japan). Inst. of Plasma Physics.

CROSS SECTIONS FOR ONE-ELECTRON CAPTURE BY HIGHLY STRIPPED IONS OF Be, B AND C FROM H2 AND Ar BELOW 10 keV

S. Takagi (Doshisha Univ.), S. Ohtani, K. Kadota, and J. Fujita Mar. 1982 31 p refs (IPPJ-565) Avail: NTIS HC A03/MF A01

Measured cross sections for one-electron capture by highly stripped ions of Be, B and C from H2 and Ar at low energies below 10 keV are nearly independent of the collision energy investigated. The distinct oscillation with incident ionic charge q in the cross sections are observed. Author

N82-28170# Nagoya Univ. (Japan). Inst. of Plasma Physics.

COLLISION EXPERIMENT ON HIGHLY IONIZED IONS

USING VACUUM SPARK SOURCE
S. Takagi (Doshisha Univ.), S. Ohtani, K. Kadota, and J. Fujita Mar. 1982 29 p refs
(IPPJ-564) Avail: NTIS HC A03/MF A01

Cross sections for one-electron capture by Fe (6+) in H2 are measured below 10 keV by using a vacuum spark ion source. It is found that the cross sections show little dependence on the collision energy and this value is about 6 x 10 to the minus 15th power/sq cm. This ion source, which has no electrode for ion extraction, can produce ions from several hundreds eV to several tens of keV and the maximum charge state of 16 in Fe at 125J discharge energy. With ion selection system of 2.7m time-of-flight and an electrostatic analyzer of 1% resolving power, 100 to 1,000 ions/pule are obtained. Because of poor reproducibility of ion beam, charge-transferred ions and unreacted ions are simultaneously with a microchannel plate which has two anodes behind. By utilizing the feature of pulsed ion beam and this ion selection system, it is possible to obtain cross sections for various charge states of ions simultaneously. Author

N82-28171# Nagoya Univ. (Japan). Inst. of Plasma Physics.
POPULATION INVERSION AND THRESHOLD CONDITION FOR LASER OSCILLATION IN OPTICALLY THIN AND THICK RECOMBINING PLASMAS
Toshiatsu Oda (Hiroshima Univ.) and Utaro Furukane (Ehime Univ., Matsuyama, Japan) Mar. 1982 25 p refs
(IPPJ-563) Avail: NTIS HC A02/MF A01

Overpopulation density (difference between the population densities per unit statistical weight of the upper and lower excited levels) is calculated as a function of the electron density for various electron temperatures in recombining hydrogen plasmas. The calculation is made for the line pairs with the principal quantum numbers, (2,3), (3,4) and (4,5). Effect of the ground level population density (n sub 1) on the overpopulation density is calculated. In this calculation the atom-atom collision and the self-absorption of the resonance lines are considered. The n sub 1 dependence of the overpopulation density remains almost constant until the self-absorption becomes significant. When n sub 1 is zero, an optimum value of the electron density for the overpopulation density. The threshold condition for laser oscillation is discussed in relation to the calculated overpopulation density. Laser oscillation is possible for the line pair (2,3) at an electron density and temperature higher than for the other pairs (3,4) and (4,5) when the self-absorption is negligible. Author

N82-28172# Nagoya Univ. (Japan). Inst. of Plasmas Physics.
STOCHASTIC MOTION OF PARTICLES IN TANDEM MIRROR DEVICES
Yoshi H. Ichikawa, T. Kamimura, and Charles F. F. Karney (Princeton Univ.) Mar. 1982 37 p refs
(IPPJ-562) Avail: NTIS HC A03/MF A01

The stochastic motion of collisionless guiding centers in tandem mirror devices is analyzed in terms of a nonlinear mapping of particle positions on the equatorial plane. Local stability analysis determines the appearance of various patterns of particle trajectories. Numerical observation of adial motion of particles makes it possible to estimate the rate of stochastic diffusion. Author

N82-28173# Innsbruck Univ. (Austria). Inst. for Theoretical Physics.
STUDIES OF PLASMA ANISOTROPY
Leonard Lewin Jun. 1982 51 p refs Sponsored in part by Fonds zur Foerderung der Wissenschaftlichen Forschung and the Austro-American Education Commission
(UNICP-FSP-82/1) Avail: NTIS HC A04/MF A01

Various combinations of anisotropy with homogeneous and inhomogeneous plasma density, and with curvature, for guides of circular and rectangular cross section were attempted. The mathematical difficulties are considerable but examples are examined which, between them, strongly suggest the following conditions for the axisymmetric torus mode resonance frequency: (1) curvature has relatively little effect; (2) anisotropy has little effect except close to ion cyclotron resonance; (3) for dense and radially varying plasmas the mean plasma density largely determines the resonance. M.G.

N82-28174# California Univ., Berkeley. Electronics Research Lab.
KINK INSTABILITIES IN LONG ION LAYERS
Douglas S. Harned 16 Sep. 1981 59 p refs
(Contract N00014-77-C-0578)
(AD-A107466; UCB/ERL-M81/73) Avail: NTIS HC A04/MF A01 CSCL 20/9

Kink instabilities in long ion layers immersed in a dense background plasma are studied. A numerical extension of the analytic model of Lovelace indicates that these instabilities will occur for values of the self-magnetic field index below those predicted previously. A quasineutral hybrid simulation code has been used to verify these lower thresholds. The simulations also show that the end of exponential growth occurs due to a nonlinear shift in the betatron frequency at large amplitude, producing an increase in layer thickness and a layer which has many non-axis-encircling ions. Author (GRA)

N82-28175# California Univ., Berkeley. Electronics Research Lab.
PLASMA THEORY AND SIMULATION Quarterly Progress Report, 1 Apr. - 30 Jun. 1981
C. K. Birdsall 30 Jun. 1981 21 p refs
(Contracts N00014-77-C-0578; DE-AT03-76ET-53064; DE-AM03-76SF-00034)
(AD-A107467; QPR-2) Avail: NTIS HC A02/MF A01 CSCL 20/9

Contents: Plasma Theory and Simulation; Lower-Hybrid Drift Instability; 2d Simulations and Nonlocal Theory; Hybrid Simulations of Theta-Pinch Rotational Instabilities; Stability of the Thermal-Barrier Cell of a Tandem Mirror: Electrostatic Simulations; Alfven Ion Cyclotron Instability: Physical Description; Relativistic Quantum Formulation of the Boltzmann Collision Integral; Code Development and Maintenance; Implicit Particle Simulation Using Moments with Orbit Averaging; Plasma Sheath Simulation in 1d; Quiet-Start Method Comparisons: Random, Bit-Reversed, and Fibonacci Numbers; Summary of Reports, Talks, Publications, Visitors. GRA

N82-28176# California Univ., Berkeley. Electronics Research Lab.
QUASINEUTRAL HYBRID SIMULATION OF MACROSCOPIC PLASMA
Douglas S. Harned 14 Sep. 1981 31 p refs
(Contract N00014-77-C-0578)
(AD-A107468; UCB/ERL-M81/71) Avail: NTIS HC A03/MF A01 CSCL 20/9

A method for solving the quasineutral hybrid plasma equations in two dimensions is presented, using full ion dynamics and inertialess electrons. The method is extended to allow plasma-vacuum interfaces of arbitrary shape. The algorithm is applied to the study of rotational instabilities in theta pinch Vlasov equilibria. Author (GRA)

N82-28177# Naval Postgraduate School, Monterey, Calif.
A COMPUTER ANALYSIS OF THE PLASMA BOUNDARY LAYER BEHAVIOR OVER A POSITIVE ELECTRODE M.S. Thesis
Stephen Ted VanBrocklin Jun. 1981 160 p refs
(AD-A107455) Avail: NTIS HC A08/MF A01 CSCL 20/9

A stable numerical procedure for solving the coupled, nonlinear equations of electron and ion conservation and electrical potential (Poisson's equation), is described. A two-dimensional model with periodic active sites on a flat plate is utilized to obtain both qualitative and quantitative results which clearly illustrate the self-generating sheath and ambipolar regions adjacent to a non-emitting electrode. The active sites are characterized as voltage sources and by electron densities depressed from both the non-active wall and the free-stream values. Various cases of species density at the nonactive wall are evaluated. Recombination/ionization plays an important role in establishing the boundary layer behavior in the ambipolar region and in the dimensionality of the problem formulation. Application is for Nitrogen gas at one amagat in pulsed discharge of about 50 micro-seconds in duration. Results clearly demonstrate the boundary layer nature of the species density at the electrode. A sheath length of 38 microns about a 35-volt active site and 5-20 microns along the

non-active portion of the electrode is established. Joule heating is determined to be not important. Author (GRA)

N82-28178# Association Euratom-FOM, Rijnhuizen (Netherlands). Inst. voor Plasmafysica.

IDEAL MHD EQUILIBRIUM OF A WEAKLY TOROIDAL PLASMA COLUMN WITH ELONGATED CROSS-SECTION. PART 2: FORCE-FREE FIELDS

E. J. M. vanHeesch and W. Schuurman Jul. 1980 16 p refs Prepared in cooperation with Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas

(Rijnhuizen-80-124) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Solutions are obtained of the ideal MHD equations describing the equilibrium of a weakly toroidal plasma with an elliptic cross-section surrounded by a force-free magnetic field with constant ratio between current density and magnetic field strength. The force-free field parameter causes the stagnation points to recede along the major axis of the ellipse. Above a certain value of the force-free field parameter, stagnation points do not exist, so that the compression ratio of the plasma column is no longer limited. The analysis was carried out to first order in the force-free parameter as well as to second order for an estimate of the error. DOE

N82-28179# Association Euratom-FOM, Rijnhuizen (Netherlands). Inst. voor Plasmafysica.

CYCLOTRON RADIATION FROM THERMAL AND NON-THERMAL ELECTRONS IN IN THE WEGA-STELLARATOR

H. W. Piekaar and W. R. Rutgers (KEMA-Lab., Arnhem) Nov. 1980 26 p Prepared in cooperation with Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas

(Rijnhuizen-80-128) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Electron cyclotron radiation measurements on the WEGA-stellarator are reported. Emission spectra around 2(NU)sub(ce) and 3(NU)sub(ce) were measured with a farinfrared spectrometer and InSb detectors. Runaway particles can be removed by increasing the plasma density. For low loop voltage discharges the electron temperature profile was deduced from thermal emission around 2(NU)sub(ce). In spite of the low E-field, runaway particles are still created and pitch angle scattered because (NU)sub(pe)/(NU)sub(ce) approximately 1. From nonthermal emission below 2(NU)sub(ce) and 3(NU)sub(ce) the energy and number of particles are calculated, and are in agreement with existing theories. DOE

N82-28180# Association Euratom-FOM, Rijnhuizen (Netherlands). Inst. voor Plasmafysica.

EQUILIBRIUM AND STABILITY ASPECTS OF A SCREW-PINCH BASED ON THE SHARP-BOUNDARY MODEL OF A HIGH-BETA TOKAMAK

J. Rem Feb. 1981 43 p refs Prepared in cooperation with Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas (DE81-700758; Rijnhuizen-81-130) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The sharp boundary model of a high beta Tokamak surrounded by force free currents (FFC) which describes the magnetohydrodynamic stability of a screw pinch: a Tokamak with uniform q-profile is discussed. The relationship between the equilibrium parameters which gives rise to a q-profile in the FFC region the poloidal field outside the plasma must be determined. An approximation is made that leads to the relationship. The stability of a screw pinch with a number of different cross-sections is analyzed. DOE

N82-28181# Association Euratom-FOM, Rijnhuizen (Netherlands). Inst. voor Plasmafysica.

HIGH-(ALPHA) EQUILIBRIA OF PLASMAS IN THE QUASI-UNIFORM CURRENT MODEL: INFLUENCE OF SHAPING THE PLASMA CROSS-SECTION AND OF THE SECOND ORDER N THE INVERSE ASPECT RATIO

W. Schuurman and C. Bobeldijk Apr. 1981 31 p refs Prepared in cooperation with Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas

(DE81-700759; Rijnhuizen-81-131) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Toroidal plasma equilibria in the high-(ALPHA) ordering in the quasiuniform current model, varying the shape of the poloidal plasma cross-section were analyzed. The effect of the second order in an expansion in the inverse aspect ratio was determined for a plasma with elliptic cross section. Analytical representation of curves with a shape deviating from an ellipse (e.g., racetrack, triangle, rectangle) enabled the treatment of high-(ALPHA) equilibria of plasmas with the curves as polodial cross-section. A smooth current profile or a flat plasma cross-section allow higher values of (ALPHA) sub(p) than a skin current or a vertically pointed cross-section. The D-shaping also improves the equilibrium (ALPHA) sub(p), especially at higher values of the ellipticity. It is concluded that the method of cross-section shaping allows the extension to higher mode harmonic contributions. DOE

N82-28182# California Univ., Livermore. Lawrence Livermore Lab.

TRANSVERSE LOSSES OF IONS IN THE END MIRROR CELLS OF AN AMBIPOLAR TRAP

L. S. Pekker Oct. 1981 39 p refs Transl. into ENGLISH of "Institute of Nuclear Physics, Siberian Branch, USSR Academy of Sciences" Preprint 81-44, Novosibirsk, 1981 p 1-35

(Contract W-7405-eng-48)

(DE82-001444; UCRL-Trans-11726) Avail: NTIS HC A03/MF A01

Transverse losses of central ions trapped in the end mirror cells of an ambipolar trap are considered. These losses are due to the pronounced elongation of the drift trajectories in the transverse direction and can significantly reduce the plasma confinement time tau sub con in the trap. A classification of the drift envelopes of the trapped ions is given, and the flow of these ions onto the diaphragm is calculated. The influence of the reverse loss cone instability and of the radial electric field on tau sub con is discussed. DOE

N82-28183# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.

A NECESSARY CONDITION FOR THE CRITICAL IONIZATION VELOCITY INTERACTION

N. Brenning Feb. 1982 30 p refs Sponsored by Swedish Natural Science Research Council

(TRITA-EPP-82-01; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

The possibility of critical ionization velocity (VC) interaction in a configuration consisting of a highly ionized plasma streaming into a region with neutral gas is discussed. The energy flow in the interaction was studied and a condition which can be used to determine whether VC interaction is energetically impossible, just possible or easily possible was derived. Parameters used are: the molecular mass, ionization potential and ionization cross section of the neutrals, the number density in and spatial extension of the region with neutral gas, and the velocity and initial electron temperature of the plasma stream. The use of the condition is illustrated by a laboratory experiment in which a hydrogen plasma stream collided with a neutral helium cloud, resulting in electron heating and braking to VC, and the fluxes of hot electrons and heavy ions recorded during the Apollo 13 Moon landing. Author (ESA)

N82-28184# AEG-Telefunken, Ulm (West Germany). Geschaeftsbereich Elektronische Bauelemente.

MATRIX DISPLAY PANEL BASED ON GAS DISCHARGE TECHNOLOGY Final Report

Manfred Schiekel, Helmut Suessenbach, Wilhelm Schwedes, Hildegard Keiner, Guenter Peppel, Wolfgang Hellwig, Anton Knoll, Renate Rettich, and Ruediger Unbehaun Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 244 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-82-FB-T-039; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 41

The components for a slim, gas discharge display panel of stacked tube geometry were developed and characterized for the presentation of color pictures. The technology of pulsed matrix display panels with a four-electrode configuration, having inherent memory, was considered. A breadboard model with maximum panel dimensions of 380 x 250 x 14 cu mm (70,000 pixels) was built. Results show that displays with long positive columns and conically shaped pixels give best brightness

and efficiency values. The reliability of such display panels is considerably increased. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-28185*# National Aeronautics and Space Administration, Washington, D. C.

THE NH BANDS AT LAMBDA 3360

G. W. Funke Mar. 1982 14 p refs Transl. into ENGLISH from Z. fuer Phys., vol. 96, 1935 p 787-798

(Contract NASw-3541)

(NASA-TM-76917; NAS 1.15:76917) Avail: NTIS HC A02/MF A01 CSCL 20K

The bands at lambda 3360 and 3370 are analyzed and their Lambda and spin splitting, as well as a widening effect, which can be observed at these bands are described. The recordings were made at a dispersion of 0.42 A/mm. Author

N82-28186*# National Aeronautics and Space Administration, Washington, D. C.

THE NH ABSORPTION SPECTRUM

Goesta W. Funke Mar. 1982 13 p refs Transl. into ENGLISH from Z. fuer Phys., vol. 101, 1936 p 104-112 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by University Physics Inst., Stockholm

(Contract NASw-3542)

(NASA-TM-76918; NAS 1.15:76918) Avail: NTIS HC A02/MF A01 CSCL 20L

The lambda 3360 absorption band of NH was recorded in large dispersion (0.9 A/mm); this facilitates considerable analysis widening against low rotational levels. It thus becomes possible to investigate the lambda splitting more precisely. Both NH and OH(+) are compared. The molecular quantities of the known ionized hydrides are also compared to the same quantities of the corresponding isoelectric neutral hydrides. The equilibrium position of the hydrogen nucleus with respect to the metal atom is discussed. A.R.H.

N82-28187*# National Aeronautics and Space Administration, Washington, D. C.

INTENSITY FORMULAS FOR TRIPLET BANDS

A. Budo Mar. 1982 12 p Transl. into ENGLISH from Z. fuer Phys., vol. 105, 1937 p 579-587

(Contract NASw-3542)

(NASA-TM-76919; NAS 1.15:76919) Avail: NTIS HC A02/MF A01 CSCL 20L

Previous work in this area is surveyed and the mathematics involved in determining the quantitative intensity measurements in triplet bands is presented. Explicit expressions for the intensity distribution in the branches of the 3 Sigma-3 Pi and 1 Sigma-3Pi bands valid for all values of the coupling constant Y of the 3 Pi terms are given. The intensity distribution calculated according to the formulas given is compared with measurements of PH, 3 Pi-3 Sigma. Good quantitative agreement is obtained. J.D.

N82-28188# New York State Univ., Albany. Dept. of Physics.

STRUCTURE STUDY OF OXYGEN-ADSORBED Ni(111) SURFACE BY HIGH ENERGY FOR SCATTERING

T. Narusawa, W. M. Gibson, and E. Toerngrist (Pennsylvania Univ.) 4 Nov. 1981 35 p refs Submitted for publication

(Contract N00014-79-C-0991)

(AD-A107528; TR-6) Avail: NTIS HC A03/MF A01 CSCL 20/8

Surface atomic structures of clean, oxygen-adsorbed, and oxidized (111) nickel have been studied quantitatively by using MeV ion scattering in combination with AES and MEED. We show that; the clean (111) nickel surface has the bulk-like structure with reconstruction or relaxation less than 0.02 A, the surface thermal vibration amplitude is enhanced by approx. 20% compared to the bulk value, adsorbed oxygen results in surface lattice expansion by approx. 0.15 A which is closely correlated to the p(2x2) or (sq root 3 times sq root 3)R30 degrees superstructure, and oxidation at room temperature saturates at a stage which incorporates approx. 3 monolayers of nickel in a stoichiometric amorphous film of NiO whereas at temperatures higher than approx. 200 C thicker oxide films are produced. Our study indicates that each oxygen atom adsorbed on the Ni(111) surface interacts with and relaxes three nearest neighbor nickel atoms, and after saturation of the relaxation, oxidation of three monolayers takes place abruptly after which the oxide layer on the surface apparently blocks further reaction. GRA

N82-28189# Lincoln Lab., Mass. Inst. of Tech., Lexington.

SOLID STATE RESEARCH: 1981 - 1983 Quarterly Technical Summary Report, 1 May - 31 Jul. 1981

Alan L. McWhorter 15 Aug. 1981 86 p refs

¡Contract F19628-80-C-0002; AF Proj. 649L)

(AD-A112696; ESD-TR-81-278) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 May through 31 July 1981. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Analog Device Technology. Funding is primarily provided by the Air Force, with additional support provided by the Army, DARPA, Navy, NASA, and DOE. Author (GRA)

N82-28190# Advanced Research and Applications Corp., Sunnyvale, Calif.

METAL-SEMICONDUCTOR REACTION PHENOMENA AND MICROSTRUCTURAL INVESTIGATIONS OF LASER INDUCED REGROWTH OF SILICON ON INSULATORS Final Report, Jan. 1979 - Jan. 1982

T. J. Magee, C. Leung, R. D. Ormond, and R. A. Armistead Jan. 1982 50 p refs

(Contract DAAG29-79-C-0014)

(AD-A112842; ARACOR-FR-82-37-1; ARO-15999.6-MS) Avail: NTIS HC A03/MF A01 CSCL 20/12

Solid phase regrowth of Silicon-on-sapphire has been investigated in the Si (amorphous)/Al(poly) Al2O3 (crystal) system. Using transmission electron microscopy, scanning electron microscopy, Auger electron spectroscopy and Hall effect measurements, it has been shown that Si is transported through an Al film at 550 C to produce p-type Si films on the sapphire substrate. The growth process has been shown to be initiated at Si nucleation sites on the substrate. These sites expand by mass accretion forming island structures that coalesce to yield continuous large grained polycrystalline Si films on the sapphire surface. The defect structure in CVD Si layers on sapphire were investigated before and after scanning laser annealing. Prior to laser annealing, the films were characterized by the presence of stacking faults, twinning zones and dislocation lines producing large regions of high disorder. Subsequent to laser annealing under conditions to produce total melting of the Si layers it was shown that liquid phase epitaxial regrowth occurred resulting in regions of defect-free Si and a total absence of twinning regions. Single-crystal Si sheets (0.2 micrometer in thickness) of (100) orientation and of maximum dimensions, 100 x 10,000 micrometer, have been recrystallized by cw laser annealing of polycrystalline Si films deposited over parallel 3- micrometer-wide SiO2 bars adjacent to 3 micrometer Si (100) substrate openings. The recrystallized films are free of cracks, mosaic structure, stacking faults or excessive mass flow at the oxide edges. GRA

N82-28191# Harry Diamond Labs., Adelphi, Md.

WORST-CASE PREDICTION OF SINGLE-PARTICLE-INDUCED PERMANENT FAILURES IN MICROELECTRONICS Technical Report, Apr. - Sep. 1980

Timothy R. Oldham and James M. McGarrity Jul. 1981 19 p refs Presented at the Electrochem. Soc. Meeting, Oct. 1980 Sponsored by DARPA and DNA

(HDL Proj. 236023)

(AD-A107309; HDL-TR-1966) Avail: NTIS HC A02/MF A01 CSCL 20/12

In recent years upsets caused by single particles passing through Si integrated circuits have been a serious concern in the semiconductor industry. In this report we calculate the

threshold voltage shift caused by a single charged particle passing through the SiO2 layer of a metal-oxide-semiconductor field-effect transistor. This calculation rests on a number of worst-case assumptions: (1) recombination is neglected, (2) charge trapping is taken to be 100-percent efficient, and (3) maximum energy loss per unit path length is assumed. Under these conditions we calculate that permanent failure caused by a single alpha particle is possible in submicrometer-dimension devices.
Author (GRA)

N82-28192# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TEMPERTAURE VARIATIONS OF SPECIMENS IN CRYOGENIC IMPACT TESTING
Chang Chun-tang, Liu Shang-yun, Song Shu-guan, Hu Xi-xing, and Zhen Sheng 25 Mar. 1982 15 p refs Transl. into ENGLISH from Acta Phys. Temp. Humilis Sinica (China), v. 3, no. 2, 1981 p 156-162
(AD-A113759; FTD-ID(RS)T-1527-81) Avail: NTIS HC A02/MF A01 CSCL 20/12

The variations of specimens in different sizes which were measured at 3 and 5 seconds following their removal separately from a bath at three cooling temperatures (213, 173, and 77 K) to 293 K are reported. The specimens were austenite stainless steel, no. 45 steel, high quality carbon steel, and aluminum. A temperature maintaining method is proposed for specimens undergoing impact tests at any temperature. T.M.

N82-28193# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
GaAs SURFACE PASSIVATION FOR DEVICE APPLICATIONS Interim Technical Report, 1 Oct. 1980 - 30 Mar. 1981
K. R. Elliott, S. P. Kowalczyk, R. W. Grant, and D. L. Miller Wright-Patterson AFB, Ohio AFWAL Dec. 1981 69 p refs (Contract F33615-78-C-1591; AF Proj. 2305)
(AD-A113808; ERC41051.66ITR; AFWAL-TR-81-1210) Avail: NTIS HC A04/MF A01 CSCL 20/12

This document is the interim report number 5 which covers the period 10/01/80 through 03/31/81 for Contract No. F33615-78-C1591 entitled 'GaAs Surface Passivation for Device Applications.' C-V and I-V measurements are reported for several GaAs (100) MIS samples. Both MBE and bulk grown GaAs samples were studied; several of the MBE grown samples had Al(1-x)Ga(x)As layers between the GaAs and insulator. Insulators formed by plasma oxidation of the Al(1-x)Ga(x)As layers and by deposition of silicon nitride were investigated. A novel As capping technique has been developed to transfer MBE grown Al(1-x)Ga(x) As samples in air into another vacuum system without surface contamination. Author (GRA)

N82-28194# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
RESEARCH ON THE CRYSTAL GROWTH AND DIELECTRIC PROPERTIES OF HIGH PERMITTIVITY FERROELECTRIC MATERIALS Annual Technical Report, 15 May 1981 - 28 Feb. 1982
R. R. Neurgaonkar, W. W. Ho, and W. F. Hall Apr. 1982 27 p refs
(Contract N00014-81-C-0463)
(AD-A114063; MRDC41091.2AR) Avail: NTIS HC A03/MF A01 CSCL 20/2

Single crystals of Sr2KNb5015 (SKN), approximately 5-8 mm in diameter and 10-20 mm long, have successfully been grown by the Czochralski technique. The crystal has ferroelectric tetragonal tungsten bronze structure with a curie temperature of about 150 C. The dielectric and electromechanical coupling constants for this crystal have been established: the polar axis dielectric constant, K33 exceeds 20,000 at the curie temperature while the coupling constants are k33 = 0.52 and k31 = 0.19, respectively. High frequency dielectric properties of SKN samples were also determined between 90-100 GHz. These measurements indicated that the bulk of the polar axis permittivity has relaxed below 90 GHz, implying that the low frequency dielectric response is not soft-mode controlled. Author (GRA)

N82-28195# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Physics.
PHASE TRANSFORMATIONS AND NONEQUILIBRIUM INTERFACES Final Technical Report, 1 Oct. 1980 - 30 Sep. 1981
J. S. Langer Sep. 1981 5 p
(Grant AF-AFOSR-0034-80; AF Proj. 2301)
(AD-A113871; AFOSR-82-0307TR) Avail: NTIS HC A02/MF A01 CSCL 20/2

This report describes progress in research on phase transformations and nonequilibrium interfaces including development of a nonlinear model of dendritic solidification and a new theory of the stability of lamellar eutectic solidification patterns. GRA

N82-28196# Rockwell International Corp., Thousand Oaks, Calif. Microelectrics Research and Development Center.
GaAs SURFACE PASSIVATION FOR DEVICE APPLICATIONS Interim Technical Report, 1 Apr. - 30 Sep. 1980
R. W. Grant, K. R. Elliott, S. P. Kowalczyk, D. L. Miller, and J. R. Waldrop Wright-Patterson AFB, Ohio AFWAL Dec. 1981 66 p refs
(Contract F33615-78-C-1591; AF Proj. 2305)
(AD-A113007; ERC41051-41ITR; AFWAL-TR-81-1209) Avail: NTIS HC A04/MF A01 CSCL 20/12

Three new MBE grown samples of graded Al(1-x)Ga(x)As on GaAs (100) have been prepared and characterized in an effort to develop a practical dielectric for GaAs surface passivation. In addition a systematic C-V study of a previously grown MBE structure as a function of oxidation time was carried out. In all cases, the thermal oxide produced on these samples appears to have excessive leakage which may be the cause for the absence of any observed inversion. An analysis of previously published results on thermally oxidized MBE grown graded layers of Al(1-x)Ga(x)As on GaAs suggests that these results may not be completely understood. Current results suggest that other insulators should be investigated as possible substitutes for the thermally grown oxides. Several device structures involving deposited SiO(x) on GaAs (100) surfaces of known composition did not produce satisfactory C-V results from a passivation criteria. A novel photochemical process was developed to deposit nearly stoichiometric SiO2 on GaAs surfaces at room temperature. Several methods of depositing Al oxides were investigated; Al deposition in the presence of an O2 plasma discharge was found to produce relatively thick layers of an intermediate Al oxide.
Author (GRA)

N82-28197# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
ELECTRONIC GRADE SILICON NITRIDE FILMS ON BULK SILICON Final Technical Report, 16 Apr. 1979 - 31 Oct. 1981
David J. Dumin Griffiss AFB, N.Y. RADC Mar. 1982 63 p refs
(Contract F19628-79-C-0094; AF Proj. 2306)
(AD-A113252; DI-5-3591/A/M; RADC-TR-82-9) Avail: NTIS HC A04/MF A01 CSCL 11/3

The production of short-channel Metal-Insulator-Semiconductor (MIS) transistors will necessitate the use of gate insulators which can be made substantially thinner than layers of silicon dioxide can be grown. One possible insulator would be thermally grown silicon nitride. The use of silicon nitride insulators could prove to be advantageous in the development of Very Large Scale Integrated Circuits (VLSIC's) since silicon nitride offers a slightly higher dielectric constant and is a better passivation layer than silicon dioxide. Transistors fabricated using thin thermally grown silicon nitride could possibly be radiation hard. The objectives of this project were to: design and build an open tube system capable of thermally growing silicon nitride on silicon using ammonia as the reactant gas; study the growth parameters of the system, optimize growth conditions and produce good thermal silicon nitride films on silicon; and fabricate simple capacitors and transistors using the silicon nitride films. GRA

N82-28198# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
GROWTH OF InP BASED FILMS USING THE HYDRIDE GROWTH TECHNIQUE Final Report, 22 Oct. 1980 - 22 Oct. 1981
Kenneth A. Jones 1981 60 p refs
(Contract N00019-80-C-0636)

(AD-A112905) Avail: NTIS HC A04/MF A01 CSCL 20/12

A hydride growth system has been constructed that is capable of growing InGaAsP films or any ternary or binary combination. The system was designed to keep the background carrier density to a minimum as there are a number of device applications for low carrier concentration films. This was done by building a system that is leak tight down to .000001/cc, and constructing a forechamber from which the substrate can be magnetically loaded through a gate valve. Therefore, the growth zone is never opened to the atmosphere during a growth run. Thus far only InP films have been grown, but we plan to soon grow InGaAs films. The first films that were grown contained many hillocks, but their density was reduced in the later films by reducing the input HCl concentration. The HCl concentration in the deposition zone was increased by introducing HCl downstream from the liquid indium. This was done to try to reduce the silicon contamination. However, we found that this greatly reduced the growth rate, and in some instances the substrate was actually etched. This also occurred when the input HCl was not forced to come into intimate contact with the liquid indium. We, therefore, concluded that there was too much HCl in the deposition zone which impeded the deposition process. GRA

N82-28199# Los Alamos Scientific Lab., N. Mex.
PLUTONIUM MICROSTRUCTURES, PART 1
Eugene M. Cramer and John B. Bergin Sep. 1981 22 p refs
(Contract W-7405-eng-48)
(DE82-002789; UCRL-53174-1) Avail: NTIS HC A02/MF A01

Illustrations of inclusions that are seen in plutonium metal as a consequence of inherent and tramp impurities, alloy additions, and thermal or mechanical treatments are presented. This part includes illustrations of nonmetallic and intermetallic inclusions characteristic of major impurity elements as an aid to identifying unknowns are included. Historical aspects of the increased purity of laboratory plutonium samples are described and the composition of the etchant solutions are given. The etching procedure used in the preparation of each illustrated sample is described. DOE

N82-28200# Philips Labs., Briarcliff Manor, New York.
GROWTH OF KH2P04 CRYSTALS AT CONSTANT TEMPERATAURE AND SUPERSATURATION Quarterly Progress Report, 1 May - 31 Jul. 1981
G. M. Loiacono and J. Zola Jul. 1981 4 p
(Contract W-7405-eng-48)
(DE82-001668; UCRL-15341-81-3) Avail: NTIS HC A02/MF A01

Three crystal-growth experiments (PL-11, 12, 13) were completed, and a fourth run (PL-14) was initiated during this quarter. A maximum growth rate of 6.3 mm/day was obtained at a supersaturation of (RADICAL)T = 50. Crystals were successfully capped in 2.5 days at (RADICAL)T = 20, with an effective growth rate of 8 mm/day. We have demonstrated that clear, unflawed growth of KH2PO4 at rates exceeding 5 mm/day along the [001] is feasible. DOE

N82-27389*# Massachusetts Inst. of Tech., Cambridge.
FLUID FLOW IN CRYSTALLIZATION PROCESSES
R. A. Brown *In its* The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 97-116 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

N82-27392*# Massachusetts Inst. of Tech., Cambridge.
HEAT FLOW CONTROL AND SEGREGATION IN DIRECTIONAL SOLIDIFICATION
A. F. Witt, W. M. Rohsenow, and P. K. Houpt *In its* The Mater. Process. Res. Base of Mater. Process. Center 28 Jun. 1982 p 123-154 (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

N82-27394*# Massachusetts Inst. of Tech., Cambridge.
RAPID SOLIDIFICATION PROCESSING
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 159-174 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

N82-27403*# Massachusetts Inst. of Tech., Cambridge.
SEMICONDUCTOR PROCESSING
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 245-259 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 20B

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-28201# Oregon Univ., Eugene. Dept. of Physics.
APPLICATIONS OF QUANTUM FIELD THEORY TO ATOMIC COLLISIONS AND SPECTRAL LINES Summary Report, 1 Jul. 1982 - 30 Jun. 1983
Marvin D. Girardeau Apr. 1982 9 p refs
(Contract N00014-81-K-0759; NR Proj. 394-055)
(AD-A113810; QFT-1) Avail: NTIS HC A02/MF A01 CSCL 20/10

Methods of quantum field theory will be applied to prediction of atomic collision and reaction phenomena in gases and partially ionized plasmas, and of the effects of such processes on electromagnetic absorption and emission spectra. Better understanding of such phenomena is important for (a) use of spectra as a diagnostic tool for assessing the state of a gas or plasma under nonequilibrium conditions; (b) prediction of the effect of a gaseous or plasma environment on propagation of electromagnetic radiation. Author (GRA)

N82-28202# Naval Postgraduate School, Monterey, Calif.
LOCAL HEAT TRANSFER COEFFICIENTS AROUND A CYLINDER IN OSCILLATING FLOW M.S. Thesis
Fred W. Brunson, Jr. Dec. 1981 147 p refs
(AD-A113836) Avail: NTIS HC A07/MF A01 CSCL 20/13

Local and average heat transfer coefficients were determined for a right circular cylinder in an oscillating flow. Spanwise platinum heater strips were used to heat the cylinder isothermally over the lower 180 degrees from the front to rear stagnation point. The four inch diameter cylinder was positioned both normal to and at 45 degrees to the flow direction. Data were gathered for diameter Reynolds numbers from 100,000 to 300,000. Large amplitude oscillations were imposed upon the mean flow using a rotating shutter arrangement. Frequencies of 0, 5, 10, 22, 50, 100, and 126 Hertz were investigated. For normal flows, local heat transfer coefficients in the wake and average Nusselt numbers were enhanced above values for steady flow, for runs having large amplitude. In the 45 degree flows, no significant change in heat transfer was noted with oscillating flow. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N82-28203# Colorado Univ., Boulder. Natural Hazards Research and Applications Information Center.
NATURAL HAZARDS OBSERVER. VOLUME 6, NUMBER 1, SEPTEMBER 1981
Sep. 1981 14 p refs
(Grant NSF ENV-76-05682)
(PB82-145764; NSF/CEE-81071) Avail: NTIS HC A02/MF A01 CSCL 05K

The issue contains brief articles and publications announcements covering covering the following topics: natural hazards reduction: the Sixth Annual Hazards Workshop, including lists of research summaries, presentations, hazards programs abstracts and session summaries; the discontinuation of the Great Lakes Communicator; earthquake prediction in Peru; hurricane relocation planning for Texas counties; hurricane message enhancement;

flood preparedness visual aids; mental health planning for disaster victims; a drought response plan; and community response to earthquake threat in Southern California. Announcements of national and international conferences, symposia, and workshops to be held are listed as well as the availabillity of recent publications. Author

N82-28204# Colorado Univ., Boulder. Natural Hazards Research and Applications Information Center.
NATURAL HAZARDS OBSERVER. VOLUME 5, NUMBER 3, MARCH 1981
Mar. 1981 17 p refs
(Grant NSF ENV-76-05682)
(PB82-145772; NSF/CEE-81069) Avail: NTIS HC A02/MF A01 CSCL 05K

The issue contains brief articles and publications announcements covering the following topics: a postflood interagency agreement; the 1983 Krakatoa earthquake; tsunamis; peak flood flows in San Diego's Mission Valley, 1978-80; disaster survival skills; a lightning victim survey; economic effects of the Mt. St. Helens eruptions; recovery planning; flood management; heat-wave deaths; and conseqences and planning for a predicted California earthquake. Announcements of national and international conferences, symposia, and workshops to be held are listed as well as the availability of recent publications. Descriptions of newly awarded grants involve geologic hazards from coal mining; disaster assistance information, tsunami risk; seismic safety policy; training for local officials; earthquake prediction; and the role of science and technology in emergency management. Author

N82-28205# Colorado Univ., Boulder. Natural Hazards Research and Applications Information Center.
NATURAL HAZARDS OBSERVER. VOLUME 5, NUMBER 4, JUNE 1981
Jun. 1981 18 p refs
(Grant NSF ENV-76-05682)
(PB82-145780; NSF/CEE-81070) Avail: NTIS HC A02/MF A01 CSCL 05K

This issue contains brief articles and publications announcements covering the following topics: drought in the Great Plains; land-use maps; and earthquake study of Kansas; retrenching in the flood plain; flash floods Southern California; flood preparedness; dissemination of disaster-related research; environment problems and planning in Canada; hazards analysis and emergency management in New England; the value of earthquake hazards information; and corporate preparedness. Announcements of national and international conferences, symposia, and workshops to be held are listed as well as the availability of recent publications. Descriptions of newly awarded grants involve earthquake risk; hazard warnings and minority groups; earthquake preparedness; climate impact; menta health of victims affected by Mt. St. Helens eruption; earthquake maps; planning for flood damage mitigation; the role of states in earthquakes and hazards mitigation; and earthquakes and the economy.
Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-28206# Council for Scientific and Industrial Research, Pretoria (South Africa). Production Engineering Advisory Service.
MINI-SEMINAR ON APPROACHES TO PRODUCTIVITY IMPROVEMENT
Aug. 1981 70 p refs
(ISBN-0-7988-2082-9) Avail: NTIS HC A04/MF A01

Management of administrative productivity is addressed. Improving productivity through routing and scheduling is discussed. Storage of merchandise is considered. Rationalization is considered. Management motivation is also considered. N.W.

N82-28207# Old (Bruce S.) Associates, Inc., Concord, Mass.
RETURN ON INVESTMENT IN BASIC RESEARCH. EXPLORING A METHODOLOGY Final Report, 1979 - 1982
Bruce S. Old Nov. 1981 76 p refs
(Contract N00014-79-C-0192; NR Proj. 274-312)
(AD-A111283) Avail: NTIS HC A05/MF A01 CSCL 05/1

Basic research funding in universities and industry, first undertaken by the U.S. Government through the Office of Naval Research beginning in 1946, is shown to have provided a very large return on investment through positive influences on knowledge developed and applied, people trained and their career contributions, new companies and industries formed, and major new contributions to national defense posture. GRA

N82-28208# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
DETERMINATION OF CONTRACT SUITABILITY TO THE AWARD FEE CONCEPT M.S. Thesis
Holly R. McLelland and David D. Odor Jun. 1981 50 p refs
(AD-A107465; AFIT-LSSR-27-81) Avail: NTIS HC A03/MF A01 CSCL 15/5

The concept of the Award Fee contract has existed within the federal government since the 1950s. The Navy and the National Aeronautical and Space Administration used Award Fee contracts on a limited basis in the early 1960s. The Air Force still considered their use experimental as late as 1978. In FY 79 Award fee accounted for 2.9 percent of all contracts over $10,000, and totaled over $1.5 billion. An estimate of the government's administrative costs for a moderate-sized Award Fee program was $115,000 annually. The burden of the administrative costs is considered to be justified when the government realizes greater benefits as a result of the Award Fee provision. There is a general lack of definitive guidance for evaluating the suitability of any contract to the Award Fee concept. With no formalized guidelines for the selection of a contract, there is no objective way to judge the possible, or probable, cost to benefit ratio of a given contract. GRA

N82-28209# Logistics Management Inst., Washington, D. C.
THE FRAMEWORK FOR LIFE CYCLE COST MANAGEMENT
Richard P. White Jan. 1982 100 p
(Contract MDA903-81-C-0166)
(AD-A113684; LMI-RE103) Avail: NTIS HC A05/MF A01 CSCL 14/1

The existing phased acquisition process, with key milestone decisions by the Secretary of Defense, is the framework for managing the life cycle costs of major weapon systems developed and produced under contracts and operated and supported by the military departments. This report defines life cycle cost and describes the framework and the several regulations, directives, and instructions that guide and direct the performance of the wide variety of functions that are parts of and influence the costs of the planning, designing, managing, acquiring, operating, and supporting of major DoD weapon systems. These include the policies and procedures for major system acquisition, the DSARC process, CAIG, R/M, quality, standardization, and contracting techniques of the award fee contract, life cycle costing, value engineering programs and incentives, and reliability improvement warranties. The report also fits each of these functions and activities into the framework, showing when each may, or must, be performed. It highlights the role of the program manager and the need for joint DoD/contractor management of the high risk process of developing major programs to meet mission needs. GRA

N82-28210# Clemson Univ., S.C. Dept. of Mathematical Sciences.
LEARNING AND COSTS IN AIRFRAME PRODUCTION, PART 1
Norman K. Womer and Thomas R. Gulledge, Jr. (Louisiana State Univ.) Oct. 1981 19 p refs Presented at the ORSA-TIMS Joint Natl. Meeting, Houston, Tex., 11-14 Oct. 1981
(Contracts N00014-75-C-0451; F33615-81-K5116; NR Proj. 365-049)
(AD-A112948; N131) Avail: NTIS HC A02/MF A01 CSCL 05/1

In recent years, there has been much interest in exploring the impact of learning and changes in production rate on program costs. Most researchers agree that learning is an important

determinant of cost, but agreement on the cost impact of production rate changes has been less certain. Still, common sense and economic theory suggest that production rate should be an important determinant of cost. This importance is also suggested by the fact that cost penalties for production rate changes now occur in some department of defense contracts. This paper does not present a theoretical justification for the integration of learning curves with traditional neoclassical economic theory. The general theoretical framework for this paper is published in previous reserach. The purpose of this paper is to extend the range of applicability of the general framework by considering a previously unexplored specification. In particular, this paper explores the joint production situation, where learning and output are simultaneously produced, and a model is presented that has potential application in the airframe industry. The theoretical properties of the model are explored, and a cost minimizing solution is presented. Finally, a strategy is proposed for adapting the model to a particular airframe program.
Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-28211# British Library Lending Div., Boston Spa (England).
NON-BIBLIOGRAPHIC ONLINE DATABASE: AN INVESTIGATION INTO THEIR USES WITHIN THE FIELDS OF ECONOMICS AND BUSINESS STUDIES
B. Houghton and J. C. Wisdom 1981 36 p refs
(PB82-149618; ISBN-0-905984-70-6; ISSN-0308-2385; Rept-5620) Copyright. Avail: British Library Lending Div., Boston Spa, Engl. CSCL 05B

A state of the art survey on the use of nonbibliographic data bases in Great Britain was conducted. Special attention was given to the fields of economics and business studies.
L.F.M.

N82-28212# British Library, London (England). Research and Development Dept.
ACADEMICS, LIBRARIANS, RESOURCE MANAGEMENT AND RESOURCE USE: A PRELIMINARY STUDY
Ernest Roe 1981 102 p refs
(PB82-148289; BLR/D-5649; ISBN-0-905984-77-3; ISSN-0306-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl. CSCL 05B

A project undertaken in Great Britain to explore the relationships between teaching methods in universities and provision and management of library resources is described. Existing relationships are surveyed and preparations for future research are made.
GRA

N82-28213*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A REVIEW AND EVALUATION OF THE LANGLEY RESEARCH CENTER'S SCIENTIFIC AND TECHNICAL INFORMATION PROGRAM: RESULTS OF PHASE 6: THE TECHNICAL REPORT. A SURVEY AND ANALYSIS Final Report
Robert A. McCullough (Graffic Traffic Studios), Thomas E. Pinelli, Douglas D. Pilley (Graffic Traffic Studios), and Freda F. Stohrer (Old Dominion Univ.) Apr. 1982 136 p refs
(NASA-TM-83269; NAS 1.15:83269) Avail: NTIS HC A07/MF A01 CSCL 05B

Current practice and usage using selected technical reports; literature relative to the sequential, language, and presentation components of technical reports; and NASA technical report publications standards are discussed. The effectiveness of the technical report as a product for information dissemination is considered.
Author

N82-28214# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Social Science.
SYMPOSIUM ON INFORMATION PROCESSING IN ORGANIZATIONS Final Technical Report, Oct. 1981 - Apr. 1982
Lee S. Sproull and Patrick D. Larkey Apr. 1982 286 p refs Symp. held at Pittsburgh, 16-17 Oct. 1982
(Contract N00014-82-G-0004; NR Proj. 170-1982)
(AD-A113658) Avail: NTIS HC A13/MF A01 CSCL 09/2

A two-day symposium was held at Carnegie-Mellon University in October 1981 to bring together social scientists doing research in the area of information processing in organizations. The eight papers were presented and discussed in detail include: The maximization process under uncertainty; Information systems in organizations; Formulating and justifying budget problems; Communicating with people in emergencies; Gossip, information and decision making; An on-going case study in technological innovation, information and ambiguity in organizational change; and The nature of managerial attention.
GRA

N82-28215# Stanford Univ., Calif. Dept. of Computer Science.
MAXIMAL OBJECTS AND THE SEMANTICS OF UNIVERSAL RELATION DATA BASES Interim Report
David Maier and Jeffrey D. Ullman Oct. 1981 14 p refs
(Grants AF-AFOSR-0212-80; NSF IST-79-18264; NSF IST-80-21338; AF Proj. 2304)
(AD-A113024; SU-STAN-CS-81-878; AFOSR-82-0272TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A concept called maximal objects, which modifies the universal relation concept in exactly those situations where it appears to go awry, when the underlying relational structure has 'cycles' is proposed. Examples of how the maximal object concept provides intuitively correct interpretations are offered. Constructing maximal objects mechanically from purely syntactic structural information, the relation schemes and functional dependencies about the data base is also considered.
Author

N82-28216# Stanford Univ., Calif. Dept. of Computer Science.
OPTIMAL DESIGN OF DISTRIBUTED DATABASES
Stefano Ceri, Shamkano Navathe (Florida Univ., Gainesville), and Gio Wiederhold Dec. 1981 49 p refs
(Contract N00039-80-C-0132; Grant AF-AFOSR-0212-80)
(AD-A113386; SU-STAN-CS-81-884) Avail: NTIS HC A05/MF A01 CSCL 09/2

Models for solving the problems of distributed data base were designed; splitting the data base into components and replication of data.
N.W.

N82-28217# California Univ., Livermore. Lawrence Livermore Lab.
TECHNOLOGY INFORMATION SYSTEM. SYSTEM DESCRIPTION
Leo R. Spogen 15 Jul. 1981 7 p
(Contract W-7405-eng-48)
(DE81-030880; UCID-19087) Avail: NTIS HC A02/MF A01

The system (TIS) is an information machine with capabilities for nationwide bibliographic and numeric database management, interactive modeling, electronic communications, and distributed networking. These capabilities are used successfully by those not intimately familiar with computers. Although many of its databases and modeling capabilities are applicable to specific user communities, the technology employed has general applicability. The objective behind TIS development, the present system configuration, and its capabilities are described. It is hoped that the understanding of TIS gained from information contained herein is sufficient for potential users to realize the effectiveness of TIS in their applications.
DOE

N82-28218# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
TEXT PROCESSING IN THE WRITING OF CONTRACTS [LE TRAITEMENT DE TEXTE AU SERVICE DE LA REDACTION DES CONTRATS]
Jacques Bernard and Jean-Claude Muller 1981 9 p In FRENCH
Presented at Conf. BUROTICA 81, Paris, 16 Jun. 1981
(SNIAS-821-422-105) Avail: NTIS HC A02/MF A01

Compilation problems encountered while drawing up contracts are discussed. Cut and paste methods were reviewed and tasks where EDP can be timesaving are identified. A text processing system is proposed. The system was implemented for a trial period of 15 months. Results are positive operationally, financially, and from a human factors point of view.
Author (ESA)

N82-28219# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
FUNCTIONAL REQUIREMENTS FOR A SOFTWARE COST DATA BASE
G. J. Dekker, M. vanderWilt, and F. J. vanderBosch 4 Feb. 1981 61 p refs
(Contract NIVR-1870)
(NLR-TR-81017-U) Avail: NTIS HC A04/MF A01

Software cost estimation techniques and available cost data bases were surveyed through the literature. Cost estimation of software development and control of cost during development are difficult due to the lack of useful cost figures from previous projects and also due to the lack of an accurate cost estimation and management method. A cost estimation method to aid cost management is proposed. To support this method, 47 cost factors are defined. It is felt that the clear definition of these cost factors is of main importance for the usefulness of the method. The implementation of a cost data base which contains data about these 47 cost factors is discussed. This data must be gathered from current projects. The cost data base can ultimately be used to determine the constants of the proposed cost estimation method. Author (ESA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-28220# Ohio State Univ., Columbus. Dept. of Statistics.
A SIMULATION ANALYSIS FOR RANKING AND SELECTING THE BEST COMBINATION OF PRODUCTION PLANNING AND ACCOUNTING CONTROL SYSTEMS
W. Thomas Lin (Univ. of Southern California, Los Angeles), Hubert J. Chen (Georgia Univ.), and Edward J. Dudewicz Mar. 1982 24 p refs
(Contract N00014-78-C-0543)
(AD-A113427; TR-261) Avail: NTIS HC A02/MF A01 CSCL 05/3

Frequently, the objective of computer simulation experiments of accounting and business systems is to find the best policy, procedure, or decision rule. Previous accounting or business simulation studies assumed that observations taken from each population were normally distributed with unknown means and known or equal variances. Unfortunately, only in rare cases can such assumptions be expected to hold. This paper introduces a multiple-ranking procedures, which allows for unknown and unequal variances, to analyze simulations of production planning and accounting control systems. The model under study is a hypothetical firm with profit and sales as multiple objectives. Two multiple objective planning models with uncertain demands are formulated, and two accounting variance analysis techniques are used and incorporated into the two planning models. A two-stage sampling procedure is used to determine the sample size. The simulated data are analyzed by a multiple-ranking procedure and then the best policy with respect to profit and sales is selected separately. Possible accounting and business applications are also mentioned. Author (GRA)

N82-28221# Jorgenson (Dale W.) Associates, Cambridge, Mass.
ENERGY-ECONOMY ANALYSIS AND APPLICATION TO R AND D PLANNING Final Report, Oct. 1980 - Sep. 1981
Edward A. Hudson and Paul A. Dorosh Oct. 1981 98 p
(Contract GRI-5080-310-0329)
(PB82-141128; GRI-81/0004) Avail: NTIS HC A05/MF A01 CSCL 05C

Projections of energy and economic conditions and analysis of energy economy interactions are based on a simulation model of the structure and growth of the U.S. economy (the Hudson-Jorgenson model). A reference projection is first constructed; this provides a reasonable estimate of future energy and economic conditions as well as providing information on economic growth, inflation and other variables required in project appraisal and R and D planning. Next, detailed analyses of energy economy interactions are performed; these examine the mechanisms through which energy changes affect economic structure and growth, and also provide a basis for quantitatively estimating the economic effects of specific energy changes. GRA

N82-27398*# Massachusetts Inst. of Tech., Cambridge.
MODELING OF MATERIALS SUPPLY, DEMAND AND PRICES
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 210-216 refs Sponsored by Bureau of Mines and NSF (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 05C

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-28222# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA) AUTHORIZATION ACT
1982 10 p An act referred to the Comm. on Com., Sci. and Transportation, 97th Congr., 2nd Sess., 17 May 1982
Avail: US Capitol, House Document Room

In addition to the appropriation to NASA of $647,300,000 for research and development, construction of facilities, and research and program management, this act provides $14,955,000 to the Department of Commerce for the planning, management, and operation of a civil land remote sensing space satellite system as well as for the establishment of user fees and the ownership of such systems by the private sector when in the national interest. A.R.H.

N82-28223# Committee on Science and Technology (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT
1982 11 p A bill referred to the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 18 Mar. 1982 and to the Comm. of the Whole House on the State of Union, 97th Congr., 2nd Sess., 5 May 1982
(H-Rept-97-502) Avail: US Capitol, House Document Room

Under title 1 of this bill, NASA is authorized to spend $5,378,400,000 for research and development, $100,000,000 for construction of facilities, and $1,168,900,000 for research and program management. Title 2 provides that the Secretary of Commerce plan and provide for the management and operation of a civil land remote sensing space satellite system, including LANDSAT D and LANDSAT D' and associated ground system equipment transferred from NASA. For this purpose $14,955,000 is authorized for the fiscal year 1983. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-28224*# Martin Marietta Corp., Denver, Colo.
TRACK TRAIN DYNAMICS ANALYSIS AND TEST PROGRAM: LOCOMOTIVE DYNAMIC CHARACTERIZATION SUMMARY Final Report

Robert L. Berry Apr. 1982 83 p refs
(Contract NAS8-29882)
(NASA-CR-162027; NAS 1.26:162027; MCR-81-577) Avail: NTIS HC A05/MF A01 CSCL 13F

Locomotive mechanical characteristics, track perturbations, and operational characteristics involving experimentally determined suspension system parameters are analyzed. Suspension bearings, shock absorbers, pads, and two- and three- axle trucks are comparatively evaluated with respect to locomotive design. A.R.H.

N82-28225# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
THE CRITICAL TECHNOLOGIES PROJECT EXECUTIVE SUMMARY Report, Dec. 1979 - Oct. 1980
Jan. 1981 97 p
(Contract MDA903-79-C-0018)
(AD-A107489; AD-E500431; IDA-R-258; IDA/HQ-81-23259) Avail: NTIS HC A05/MF A01 CSCL 15/3

The Critical Technologies Project, to develop recommended entries for the Militarily Critical Technologies List (MCTL) in selected technology areas to introduce an MCTL into the export control procedures is discussed. Author

N82-28226# California Univ., Livermore. Lawrence Livermore Lab.
PROJECTED ELECTRICAL CHARACTERISTICS OF THE DYNAMIC RPEV SYSTEM
J. D. Salisbury and C. E. Walter Sep. 1981 62 p
(Contract W-7405-eng-48)
(DE82-000702; UCID-19188) Avail: NTIS HC A04/MF A01

The principle of the roadway powered electric vehicle system (RPEV) is to propel a moving vehicle by the transfer of electrical power from a powered roadway. Power is transferred by electromagnetic induction. The system behaves like a transformer with an air gap. The powered roadway or energy source is the primary, the vehicle-mounted power pickup is the secondary, and the air gap permits power to be transferred without mechanical connections while the vehicle is in motion. An independent energy source for propulsion, e.g., batteries, is provided to allow operation away from the powered roadway. Considerable data exists from test results of the RPEV system in the static mode. To determine operating characteristics of an RPEV in motion, a dynamic test system has been constructed at LLNL. DOE

N82-28227# International Road Federation, Washington, D.C.
WORLD SURVEY OF CURRENT RESEARCH AND DEVELOPMENT ON ROADS AND ROAD TRANSPORT, 1981 Annual Report
Dec. 1981 525 p refs Sponsored in part by Organization for Economic Cooperation and Development and Transportation Research Board
(Contract DTFH61-81-C00023)
(PB82-154188) Avail: NTIS HC A12/MF A01 CSCL 13B

This is the 16th in a series of annual reports on inventories of research and development projects conducted by governmental, academic and commercial research organizations in 54 countries. It is the only publication that reports world wide information on current research activities in the highway field. The report lists 4,988 projects, classified in accordance with the subject area classification system of the Transportation Research Board. GRA

N82-28228# Computer Horizons, Inc., Cherry Hill, N. J.
TEN YEAR TRENDS IN US TECHNOLOGICAL DEPENDENCE ON FOREIGN SCIENCE AS INDICATED BY REFERENCING FROM US PATENTS. PHASE 1 REPORT: A FEASIBILITY STUDY
Mark Carpenter 22 Jun. 1981 62 p refs
(Grant NSF PRA-80-17357)
(PB82-146176; NSF/PRA-81010) Avail: NTIS HC A04/MF A01 CSCL 05A

A feasibility study for a proposed full scale examination of recent trends in the United States and foreign Technological interactions is presented. Certain questions were chosen for the study based on the validity of using examiner citations to scientific dependence literature and to foreign patents as indicators of science dependence and foreign dependence. Twenty-four technologies were selected and divided into three broad patent areas-chemical, electrical, and mechanical. After rankings on science dependence and foreign dependence were received, a consensus ranking on each dependence was determined. Results of the study indicate a high correlation between top level research manager's consensus ranking of technologies on foreign and science dependence and rankings based on examined citations and other bibliographic information. GRA

N82-27406*# Massachusetts Inst. of Tech., Cambridge.
TECHNOLOGY TRANSFER AND INTERNATIONAL DEVELOPMENT: MATERIALS AND MANUFACTURING TECHNOLOGY
In its The Mater. Process. Res. Base of the Mater. Process. Center 28 Jun. 1982 p 285-287 refs (For primary document see N82-27382 18-23)
Avail: NTIS HC A13/MF A01 CSCL 05A

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-28229*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-RAY SPECTRA OF THE CRAB PULSAR AND NEBULA
Steven H. Pravdo (California Inst. of Technology) and Peter J. Serlemitsos 1981 20 p refs
(NASA-TM-84761; NAS 1.15:84761) Avail: NTIS HC A02/MF A01 CSCL 03A

The spectrum of the Crab pulsar was measued from 2 to 50 keV as a function of pulse phase and a progressive hardening and subsequent softening of the spectrum across the pulse was found. The fraction of the pulsed flux which exhibits spectral variability is 0.14 and is concentrated solely in the region between the two peaks. A model is suggested in which the pulsed X-ray emission from the Crab pulsar consists of two components: one which has no spectral dependence with pulse phase and which is physically related to the double peaked gama ray pulse and, perhaps, the radio and optical pulses; and another component which exhibits spectral variability with pulse phase is confined to and comprises the interpeak emission, and which is only seen at X-ray energies. These results and studies of the binary X-ray pulsar Hercules X-1 suggest a phenomonological similarity. If the spectrally varying component in the Crab pulsar arises from a hot, magnetized plasma near the neutron star surface then higher energy spectral observations of this phase region might reveal spectral features which can be used to determine the surface field strength. M.G.

N82-28230# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
STRUCTURAL DESIGN OF A LARGE DEFORMABLE PRIMARY MIRROR FOR A SPACE TELESCOPE Ph.D. Thesis - Arizona Univ.
James Gerald Raymond Hansen 1981 187 p refs
(AD-A107260; AFIT-CI-81-15D) Avail: NTIS HC A09/MF A01 CSCL 20/6

A 4 meter aperture deformable primary mirror is designed with the mirror and its supports integrated into a single structure. The integrated active mirror's minimal weight makes it desirable for a space telescope as well as a terrestrial application. Utilizing displacement actuators, the active controls at the mirror's surface include position control and slope control in both the radial and tangential directions at each of the 40 control points. Influence functions for each of the controls are nearly independent, reducing the complexity of the control system. Experiments

with breadboard models verify the structural concept and the techniques used in the finite element method of computer structural analysis. The majority of this paper is a description of finite element analysis results. Localization of influence functions is exhaustively treated. For gravity loads, a thermal gradient through the mirror thickness, and a uniform thermal soak, diffraction limited performance of the 4m design is evaluated. Loads are applied to defocus the mirror and to cause fourth-order astigmatism. Mirror scallop, instigated by a focus shift, has been virtually eliminated with the 40-actuator design. The structural concept is so effective that it should be considered for uncontrolled primary mirrors as well as active mirrors. GRA

N82-28231# European Space Agency, Paris (France).
ACCELERATOR CALIBRATION OF THE LOW ENERGY TELESCOPE (LET) OF THE INTERNATIONAL SOLAR POLAR MISSION COSPIN EXPERIMENT
J. F. LeBorgne (ESTEC, Noordwijk, Netherlands), J. Henrion (ESTEC, Noordwijk, Netherlands), R. G. Marsden (ESTEC, Noordwijk, Netherlands), T.R. Sanderson (ESTEC, Noordwijk, Netherlands), and K.-P. Wenzel (ESTEC, Noordwijk, Netherlands) Dec. 1981 27 p refs
(ESA-STM-224; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

The COSPIN telescope was exposed to beams of 250 MeV/nucleon neon and 284 MeV/nucleon argon in order to determine the optimum settings of the LET particle identifier discriminators for the high energy response region. Data from previous calibration were normalized to those of the tests enabling equivalent discriminator settings to be optimized for the low energy region. Thresholds used to separate protons from helium could not be set directly. The telescope can separate adjacent elements in the range 5 to 50 MeV/n, up to argon, with a resolution > 7 standard deviations for argon. Off-line analysis of the calibration data reveal crosstalk between the anticoincidence detector D4 and the residual energy detector D3. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-28232*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MIDLATITUDE Pi2 PULSATIONS: AFGL AND ISEE MAGNETOMETER OBSERVATIONS CORRELATED
W. J. Hughes (Boston Univ.), H. J. Singer (Boston Univ.), and N. C. Maynard [1982] 10 p refs
(Grant NsG-5407)
(NASA-TM-84763; NAS 1.15:84763) Avail: NTIS HC A02/MF A01 CSCL 03B

The ISEE observations of the pi2 magnetic pulsations occuring substorm onset in the inner magnetosphere are discussed. One of these events which was also detected as a pi2 event by the AFGL midlatitude magnetometers is considered. The event occurred when the foot of the ISEE field line was over North America. The ground and satellite signals are remarkably similar: they start and stop at the same time, have the same period and can be correlated cycle by cycle. The waves are detected in the electric field data from ISEE 1 and in the magnetic field data from both ISEE 1 and ISEE 2. Calculation of the Poynting vector at ISEE 1 shows that the energy flowed mainly westward, but that there was also a component towards the nearer (southern) ionospheric foot of the field line. The phases between the various field components measured by ISEE 1 and 2 indicate that this is a standing hydromagnetic oscillation. J.D.

N82-28233# Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin (West Germany).
COSMIC RADIATION. RESULTS FROM SATELLITE EXPERIMENTS. A LITERATURE SURVEY
D. Zappe 1980 39 p
(SAAS-266) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

An introduction overview of the present views on the cosmic radiation situation is presented. Problems of radiation measurement and protection encountered in cosmic research and manned space flight are treated. DOE

N82-28234# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ON HIERARCHICAL COSMOLOGY
Hannes Alfen 1982 27 p refs Prepared in cooperation with California Univ., La Jolla
(TRITA-EPP-82-03; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

The paradigm transition in cosmic plasma physics towards inhomogeneous models with features such as double layers, cell walls and filaments is discussed. A model ('Fireworks model') which accounts for the void region between the de Vaucouleurs (dV) and Laplace-Swarzchild limits is outlined. A hierarchical structure results from the explosion of a developing structure which reaches the dV limit. The explosion of this primary cloud, or protometagalaxy, causes metagalactic expansion. The largest fragments become protosuperclusters, which explode emitting protoclusters, which similarly form galaxies. Annihilation is a likely energy source for the explosions. In a cosmic cloud consisting of koinomatter and antimatter separated by Leidenfrost layers, a stationary equilibrium requires that $n1/nS = VS/V1$, where n1 is the density of the annihilation electrons, V1 their temperature in the Leidenfrost layer, and nS and n1 are the corresponding values in the slabs of matter. If VS becomes comarable to V1, the Leidenfrost layer cannot operate efficiently, so general annihilation, resulting in an explosion, occurs. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-28235*# Texas Univ., Austin. Marine Geophysics Lab.
LUNAR SEISMIC DATA ANALYSIS Final Technical Report, Feb. 1978 - Jun. 1982
Yosio Nakamura, Gary V. Latham, and H. James Dorman 30 Jun. 1982 21 p refs
(Grant NsG-7418)
(NASA-CR-169093; NAS 1.26:169093; Contrib-530) Avail: NTIS HC A02/MF A01 CSCL 03B

The scientific data transmitted continuously from all ALSEP (Apollo Lunar Surface Experiment Package) stations on the Moon and recorded on instrumentation tapes at receiving stations distributed around the Earth were processed. The processing produced sets of computer-compatible digital tapes, from which various other data sets convenient for analysis were generated. The seismograms were read, various types of seismic events were classified; the detected events were cataloged. Author

N82-28236*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
FINDINGS ON RINGS AND INNER SATELLITES OF SATURN BY PIONEER 11 Progress Report
James A. VanAllen Mar. 1982 69 p refs Submitted for publication
(Contracts NAS2-6553; N00014-76-C-0016; Grant NAS2-11125)
(NASA-CR-169082; NAS 1.26:169082; AD-A112750; UI-82-3) Avail: NTIS HC A04/MF A01 CSCL 03B

The introductory part of this paper gives a short account of the theory of absorption by planetary rings and satellites of energetic charged particles that are trapped in a planet's magnetic field and describes the observable consequences of such absorption processes. The University of Iowa observations of absorption features during Pioneer 11's passage through Saturn's inner radiation belt on 1 September 1979 are critically re-analyzed and related to other evidence on rings and inner satellites, especially that from Voyagers 1 and 2. It is found: (1) that satellites 1979 S1, 1979 S2, and 1980 S3 are almost certainly

identical; (2) that 1979 S4 appears to be the shadow of an otherwise unreported satellite of radius < or approx = 25 km at an orbital radius of 151,300 + or - 80 km and at a longitude between 195 deg and 208 deg at JED 244 4118.25654; (3) that 1979 S5 and two other nearby absorption features and 1979 S6 and one other nearby absorption features are probably caused by longitudinal and radial structure of Ring F; and (4) that absorption feature 1979 S3 at 169,300 + or - 600 km is identified with Ring G. GRA

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

No abstracts in this category.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

No abstracts in this category.

99 GENERAL

N82-28237# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES
F. A. Richards, ed. and Don J. Peters, ed. 31 Dec. 1981 39 p
(AD-A110691; ESN-35-12) Avail: NTIS HC A03/MF A01 CSCL 05/2

Contents: Blood Lead Concentration and Performance; Task Complexity and Team Organization; Tobacco Use: Smokers, Snuffers, and Stoppers; International Symposium on Recent Advances in Enteric Infectious, Bruges, Belgium, 8-11 September 1981; 32nd Meeting of the International Society of Electrochemistry in Dubrovnik/Cavtat, Yugoslavia: 13-20 September 1981; Laboratoire D'Information Pour La Mecanique Et Les Sciences De L' Ingenieur (LIMSI), France; Centralized Government Management Information System in Israel; The IBM Israel Scientific Center: An Ultrasound Signal Processing, Facility; Lightning Research in the Ivory Coast, Italy, and France; Metallurgical Research at the Royal Aircraft Establishment; Some Processing Research at Imperial College; Magnet Manufacturing in Sussex; Solid State Physics in Stockholm. GRA

N82-28238# Air Force Geophysics Lab., Hanscom AFB, Mass. Office of Technical Plans and Operations.
AIR FORCE TECHNICAL OBJECTIVES DOCUMENT, FY 1983
Nov. 1981 29 p Supersedes AFGL-TR-80-0210
(AD-A112281; AFGL-TR-81-0287; AFGL-SR-229; AFGL-TR-80-0210) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report describes the five Technology Planning Objectives in environmental technology. The environmental areas of concern include optical and space physics, meteorology, aeronomy and terrestrial sciences. In addition, a brief summary of the basic research program is included. GRA

N82-28239# Air Force Systems Command, Washington, D.C.
AIR FORCE SYSTEMS COMMAND RESEARCH PLANNING GUIDE, RESEARCH OBJECTIVES
1 Feb. 1982 211 p Supersedes AFSC-TR-80-01
(AD-A112242; AFSC-TR-82-01; AFSC-TR-80-01) Avail: NTIS HC A10/MF A01 CSCL 15/3

The purpose of the Planning Guide is to direct the attention of the scientific community to the technology interests of the Air Force, to provide a prospectus of research objectives to which the scientific community can respond, and to document the relevancy of fundamental research to the Air Force mission. The research objectives described represent the combined counsel of technical directors and program managers at the 14 Air Force research and development organizations. These objectives enunciate scientific opportunities which, when exploited, will provide fundamental knowledge required to develop future Air Force systems, prevent technological surprises, and provide alternatives in solving technological problems which mitigate the quanitative superiority of Air Force systems. The objectives are grouped into seven technical areas: life sciencies, materials, geophysics, aerospace vehicles, propulsion and power, weaponry, and electronics. These areas relate directly to Air Force mission areas and involve such scientific disciplines as physics, chemistry, biology, psychology, mathematics, and engineering. GRA

N82-28240# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Plans and Programs Office.
AFWAL FY80 TECHNICAL ACCOMPLISHMENTS REPORT Final Report, 1 Oct. 1979 - 30 Sep. 1980
R. S. Hoff Dec. 1981 96 p
(AD-A112255; AFWAL-TR-81-0001) Avail: NTIS HC A05/MF A01 CSCL 01/3

The broad range of R&D activities being undertaken at the four AFWAL Laboratories and the significance of the technological contributions being made to enhance Air Force operational capabilities is highlighted. Topics cover propulsion systems, jet aircraft, fiber optics, ramjet engines, chemical lasers, flutter, guided missiles, airframes, display systems, alloys, composite materials, and jet engine fuels. GRA

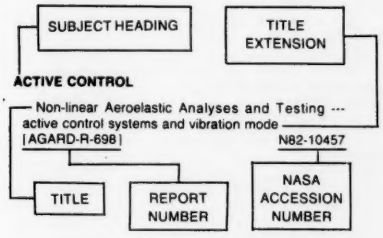
N82-28241# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 36, NUMBER 2 Monthly Publication
Francis A. Richards 28 Feb. 1982 29 p
(AD-A113418; ESN-36-2) Avail: NTIS HC A03/MF A01 CSCL 05/2

Contents: Landing Aids Research at the UK Royal Aircraft Establishment; Peacetime Suicide in the Military; Bioelectrochemistry at Erice, Sicily; Biophysics of Cell Surface - An International Meeting; Cardiac Rehabilitation-A World Congress (Part 2); Computer Architecture Research at Newcastle upon Tyne (UK); Pisa-Origin of Computing Research in Italy; Electrochemistry at the University of Dusseldorf; Eighth International Congress on Metallic Corrosion; Metal Spraying at University College - Swansea; Using Asymptotic Expansions to Find Approximate Confidence Intervals. GRA

N82-28242# Rome Air Development Center, Griffiss AFB, N.Y.
RADC TECHNICAL OBJECTIVE DOCUMENT (TOD) C(3)I, FISCAL YEAR 1983
Carlo P. Crocetti, ed. Dec. 1981 68 p
(AD-A113187; RADC-TR-81-367; RADC-TOD-81-11) Avail: NTIS HC A04/MF A01 CSCL 17/2

This TOD describes the technical programs of the Rome Air Development Center in support of the Air Force Command, Control, Communications, and Intelligence (C3I) mission. The technical objectives have been aligned with the VANGUARD mission areas of Command, Control, and Communications (C3), Reconnaissance and Intelligence, Strategic Systems (Defense), and Technology as a means of focusing the RADC support of VANGUARD. This document is prepared to provide industry and universities with the midterm technical objectives in these areas. Author (GRA)

Typical Subject Index Listing



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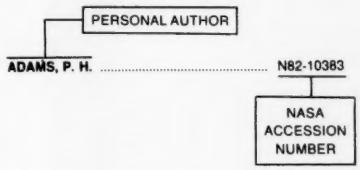

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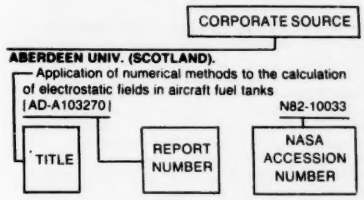

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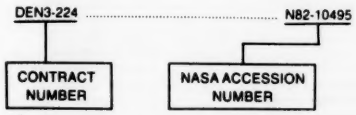

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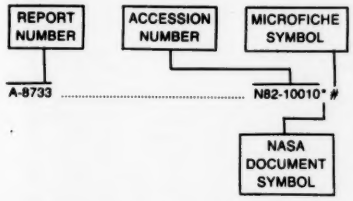

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